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JOURNAL

OF THE

BATH AND WEST OF ENGLAND SOCIETY

FOR THE ENCOURAGEMENT OF

AGRICULTURE,

ARTS, MANUFACTURES, AND COMMERCE.

WORK AND LEARN.

55059

VOLUME VI.

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1858.

"He that goes about to forward agricultural improvement must begin by finding out the true reasons of what is called routine, or the 'custom of the country.' It sometimes happens that these reasons are only accidental, and then you may dismiss them fearlessly; but it often turns out that every-day practice rests on a solid foundation of facts; and then if you make an onslaught on local prejudices, they will be sure to beat you.

"The true course for the agricultural improver is, to take one step at a time, to gain a clear insight into facts by experience, not to try to go too fast, and to trust to the work of time.

"If practice which sets up to do without theory is contemptible, theory without practice is foolhardy and perfectly useless."—*From the Rural Economy of England, Scotland, and Ireland.* By LEONCE DE LAVERGNE.

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INTRODUCTION.

Our volume for 1858 contains little which is not either of home-growth or of our own importation.

It is with much regret that we have been obliged to omit valuable matter, marked for reprinting from other sources, in deference to the prior claims of contributors within the West of England district. Some of the Prize Essays doubtless contain much that is compiled from matter already in print; but it will be remembered that, by the rules of competition for Prize Essays, competitors are encouraged to record the experience of others, provided that the sources from which their information is drawn be distinctly acknowledged,—a provision which the Editor trusts has been in every case frankly complied with. Some of the matter in the present volume treats of scientific problems still unsolved, and some of practical questions in which there is room for much difference of opinion. Whatever pains may be taken to correct statements obviously inaccurate, or to qualify opinions open to serious objection, the statements made by individual authors in this volume must, after all, only rest on the testimony and reasoning by which they are able to support them.

For the early publication of the Reports on the Implement Exhibition at Newton, we are indebted to the Judges, by whom they were promptly furnished, and also to the Stewards, Mr. Knollys and Mr. John Gray, for the pains taken by them to give effect to the wishes of the exhibitors and the Council; nor is this the only evidence contained in the present volume of the practical zeal and care bestowed by those gentlemen on the Implement department of our Exhibition, which, for thorough efficiency in the tests supplied at the trials and for encouragement to the exhibitor of every grade, may bear comparison with that of any Society. Considerable progress has been made this year with reference to the trial of steam-engines, but we leave it to the Stewards to speak of their regulations after they have acted on them.

In the Stock department, the appointment of a veterinary surgeon has been followed by practical results which have fully justified the Council in calling in professional aid to enforce compliance with their regulations. Professor Brown's contribution to the present Journal will place in the hands of every exhibitor the opportunity of correcting, if he can, by enlarged observation, the indication of age afforded by the teeth, as well as give general currency to the standard of judgment recognised among professional men.

The Journal Committee cannot but congratulate the Council on the publication under their authority of a paper so full of useful information and careful research as Professor Voelcker's Report on the Lime, Marl, and Sand of the West of England. Never were congratulations more heartily offered than those of the Council in the name of the whole Society to the Professor on his elevation to the high and influential post of Consulting Chemist to the Royal Agricultural Society. The conscientious researches in analytical chemistry of his predecessor Professor Way have led the scientific world to expect much from any one filling that situation, but our own experience of Professor Voelcker's power in grappling with the tangled web of facts which ramifies through English agriculture, and the singular advantages which he possesses as a practical teacher of young men engaged on a farm, leave us no room for doubt that he will be found fully equal to the task he has undertaken. Every year shows more plainly that the science and practice of agriculture in England require for their advancement the devotion of the very highest scientific powers to the gradual unfolding of the mysteries involved in the functions of animal and vegetable life. It is but little that a local Society like our own can do in this direction; but in this free country, where great enterprises are the work of the people, not of the Government, who can hold out adequate inducements to scientific men to devote themselves to agriculture, if it be not the first Agricultural Society in the world? We firmly believe that, with so great a national object in view, the funds of that Society might be doubled, and we cannot cease to urge the support of the Royal Agricultural Society on all our own Members who aspire to be ranked as first-class farmers.

Meanwhile, in its more humble sphere, we trust that the Bath and West of England Society is steadily advancing towards the time when its local exhibition may be made to support itself, and thus set free a larger portion of our funds for the advancement of science and the diffusion of useful information at least in the West of England.

We beg the special attention of all our friends to an extract from the Report of a Committee on the Expenditure and Income of the Society, and on the value of its plant, and to the public-spirited Circular* signed by some of the leading men connected with agricultural business in the West of England. When the amount of valuable time which many of the Members of the Council give up to the practical working of our Society is considered, and when the amount of real work which has been done with very limited funds is taken into account, we cannot doubt that their appeal to the agricultural public will be heartily responded to. The fact is, that the ordinary subscription of one class of members has been merely a nominal source of income. When the price of the Journal, the free ticket, and other privileges are calculated, it is not quite clear whether the general fund of the Society gains sixpence from the ten-shilling subscriber, or makes him a present of that amount. Meanwhile, through the excellent financial foresight and public spirit of Mr. Jonathan Gray, the Society has accumulated a property in shedding and other plant almost equal to the requirements of its Exhibition—an achievement which has this great practical value, that it will place the Society in a position to confer the benefit of a visit on the remotest corner of the district without nicely weighing the amount of local contribution. And yet these very words may serve to remind the reader that no local contribution has ever yet reached the magnificence of the funds raised in the North of Devon for a meeting at Barnstaple; and that during the present year the Exhibition is carried across the Bristol Channel by the liberal invitation of the town of Cardiff.

For how long a period a useful career may lie before our Society in its present form—how long an annual demand for its visit may be kept up—it may be unsafe to predict. There is no evidence of slackening yet. This, however, is clear, that its popularity rests upon the conviction of its thorough efficiency and the disinterested zeal of its managers. But, general as this conviction is at present, a general conviction is like a general invitation to dinner: it does not always descend to particulars. Now, our advice to every member of the Bath and West of England

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* See page xv.

Society is, “Don't give a general invitation to your neighbour “ to join the Society, but take him to the Bank, and see his subscription paid. If he is a *first-class* yeoman or tradesman, no “ doubt he will pay 20s. Of course you will pay him the compliment to ask for 20s.; but if you cannot get twenty, take “ ten, and ask Mr. Roberts to send him a receipt and the Journal “ postage paid.”

During the past year the Council has taken in hand, on the motion of Mr. Charles Gordon, one of the most important subjects which can possibly engage the attention of an Agricultural Society—the consideration of the covenants and customs regulating the relation between landlord and tenant. This subject is indissolubly connected with the memory of Philip Pusey; and to more than one of his intimate friends in the Council who worked with him on this subject in either House of Parliament it must be no light satisfaction to see so fair a prospect of the solution of a difficult problem by the influence on public opinion of voluntary societies.

The Council, on the motion of Mr. Gordon, appointed a Committee on the 28th November, 1857, to consider—

“Whether the Society may with advantage prepare some suggestions for arrangements between landlord and tenant for the cultivation of land in the West of England suitable to the advanced state of agriculture; and to consider other subjects connected therewith which may tend to promote its further progress.”

The proceedings of the Committee have not yet transpired, but it is no breach of confidence to state that the Committee have held several meetings, which have been throughout most harmonious; and that their deliberations are likely to issue in practical suggestions of great value.

Speaking on behalf of the Journal, the Editor cannot but regret that this volume does not contain a Report from the Committee. For the preparation of such a Report instructions were given, founded on conclusions at which the Committee had arrived, and the draft was prepared with considerable expenditure of time, which has helped to retard the publication of the Journal; but various causes hindered the Committee from considering it in time for the last meeting of the Council.

This brief chronicle of the proceedings of the Society would be incomplete without some allusion to another result of the harmony of its councils and the readiness of its members to co-operate for public objects. The fourth volume of the Journal for 1856 contained a memorandum read by Lord Ebrington on Middle Class Education, and recorded the formation of a Committee from among its members with reference to his Lordship's offer of a prize to young farmers in Devonshire. The last volume contained the details of a scheme of "Prizes for Practical Schools in the West of England," to which the Society contributed a life-membership as a prize, affirming at the same time the principles "that the best preparation for practical life is a good general education," and "that the co-operation of independent examiners with a local Committee was well calculated to secure confidence in the results of the examinations."

In the present Journal we have the pleasure to record the fact that a test of "good general education" is this year offered to the whole of England, under the conduct of examiners especially appointed by the Universities of Oxford and Cambridge, and that the scheme for "local Committees to co-operate with these examiners," first inaugurated in the West of England by an Agricultural Body, has been followed by the appointment of similar Committees in the great centres of population—Liverpool, Manchester, Leeds, Birmingham, Bedford, London, Southampton, Cheltenham, and, to come home to the birthplace of our Society, in Bath.

The local examinations at Bath and Exeter will commence simultaneously with those at the other centres on the 21st of June, and continue till the 26th. The results will be published as soon as the awards can be made, the decision of which will probably require a period of five or six weeks; the number of candidates being 1200, of whom 83 will be examined at Exeter and 74 at Bath.

The regulations adopted at Oxford and Cambridge may be very interesting as a guide to those who have children to educate, we therefore print them in the Appendix, inviting especial attention to the importance attached by both Universities to the *elementary* part of education.

As the phrase "Middle Class Education" owes possibly some of its present currency to its appearance in this Journal in connexion with Lord Ebrington's prize, we do not scruple to reprint the following remarks which have been echoed from the sister country in a very striking article by Dr. Shaw, one of the tutors of Trinity College, Dublin :*—

"I. The phrase 'middle-class education' may seem at first sight to be indefinite in meaning, inasmuch as the different sections of our middle class exhibit the widest diversity in the kind and amount of education which they receive. But much of this indefiniteness will disappear from the expression when the adjective 'middle-class' is understood to apply, not so much to the individual educated as to the education itself, as one lying between the high culture attainable at a university, and the humble rudiments acquired at a parish school. It is an education, then, which, while it does not aspire to make philosophers or scholars, yet aims at qualifying a man for higher work than that of hewing wood and drawing water; one which fairly develops his faculties of observation, of judgment, of reasoning; which enables him to bring some intelligence to the affairs of his office, his shop, or his farm; which prepares him for the ordinary duties of a citizen in a free state; and gives independence to his vote, and weight to his opinion. Such an education need not involve a knowledge of Greek, of Metaphysics, or of the higher Mathematics, but it ought to bestow some command over English and French, some insight into History, Political Economy, and Physical Science, and some power of enjoyment in the fields of Literature and Art.

"That the education given at our middle-class schools is in general meagre and slovenly,—that these schools are far less effective for their purpose than classical schools are for University education, or than most parish schools now-a-days are for primary education,—seems to be generally admitted. If a labouring man or handicraftsman can only leave his son a reasonable time at a national school, the boy will be able to acquire all the education that his future station and occupations in life require. Or if a youth who is designed for a University career avails himself of the teaching afforded at our classical schools, he will find himself, on entering College, very fairly prepared to address himself to the studies imposed on him. But a boy may remain till 16 or 17 in a middle-class school, and may learn all that the school teaches, and yet leave it most inadequately prepared for the business and the social position which await him. Whence this difference? It is not from any difference in the masters; for in the common case of mixed schools, where the same master directs the education both of classes preparing for the Universities and of classes preparing for business, we constantly find that the University education is excellent, while the middle-class education, usually that of the majority, is grossly neglected. Nor is the difference due to anything inherent in the nature of middle-class education, for the subjects it includes are naturally more attractive to boys than the dead languages, and present a more obvious utility. The causes are perhaps manifold: but the following three appear to us to be at once the most influential and the most removable.

---

* Middle-Class Education, by G. F. Shaw, LL.D., Fellow and Tutor of Trinity College, Dublin. Printed at the University Press. Dublin. 1858.

"First, *the want of a well-defined aim.* The master of a classical school on the one hand, or of a National School on the other, knows exactly what he is expected to teach, and what his boys will have occasion for on leaving him. The University Curriculum guides the one, the rules of the National Board [in England, Committee of Council on Education] or of the Patron instruct the other: but the middle-class schoolmaster is left to his own judgment or convenience as to what he will teach, and what omit, and that in a case really more difficult and more in need of the best guidance to be had than either of the other two: for his pupils are to be prepared, not for a University where there will be time and opportunities to correct many of the defects of their school education, but for practical life, and not for a low position in life either, but for one which often gives considerable social influence, and commensurate responsibilities.

"The second circumstance which operates prejudicially against our middle-class school, *is the want of an improved method of instruction.* This question of method is one which has of late years received particular attention from the officers of the National Systems of Education both in England and Ireland, and probably the methods now in use in training and model schools, and even in well-managed parish schools, are better than those followed in the best classical and commercial schools. But whatever room there may be for improvement in classical schools as respects method of instruction, there is not that utter absence of system or plan which characterizes the teaching of our middle-class schools. Thucydides is never read before Xenophon; nor Tacitus before Cæsar. Attention is not confined by one master to parsing, by another to translation, by a third to historical or critical explanation. The definiteness of aim enjoyed by classical schools produces a corresponding exactness and harmony of method; and the teaching instituted at the Universities is copied at the great schools, and repeated through all the classical seminaries of the kingdom. But is anything like this unanimity of plan perceivable in our middle-class schools? In their teaching of English composition, of History, of French, nay, of such well-established subjects as Arithmetic or Spelling, or the Art of Reading aloud,—does one school resemble another? or is there in the majority of schools anything worthy of being called a method? Or consider, for example, the use made of Dictation as an educational process; a process so potent, in the hands of an able master, for cultivating the power of attention, memory, and judgment, for exhibiting the structure of sentences, for teaching the genesis, and history, and subtle distinctions of words. In most middle-class schools this engine is scarcely used at all; where it is used, it is commonly committed to the hands of the writing-master, or some junior usher, who regards it merely as an exercise in calligraphy, or, at most, in that and spelling. Now, whenever middle-class education begins to overhaul its method, Dictation will be always assigned to the most accomplished master in the school, and will be, not an occasional, but probably a daily task.

"The third and most fundamental defect in our middle-class schools is *the absence of any easy and certain test by which parents may distinguish the good school from the bad, the really efficient master from the plausible pretender.* In the case of classical schools, this test is supplied by the Entrance Examinations of the University; and the character of the school rises or sinks with the places obtained by the pupils entering from it. In the case of national and other primary schools the pupil's acquirements are tested by official inspectors, and on the reports of these depends the advancement of the master. But the middle-class school is submitted neither to official inspection nor to University examination. The master has little stimulus to carry him through the drudgery of his profession, over and above his sense of duty; the parent has no guarantee of the master's merit beyond the fallacious one of high price and pompous references. We cannot be surprised that the results are the same as in other kinds of business where the purchaser is obliged to take the dealer's word for the value of the article he buys. Indeed, considering that there is no article which takes so long to manifest its defects as education does, the wonder is, not that middle-class schools are so indifferent as they are, but rather, that they are not worse.

"In what precedes, we have for distinctness' sake spoken of classical education and middle-class education as if they were never united in the same establishment, but always given apart each from the other. This, of course, is not the case, and in Ireland mixed schools are the rule, not the exception. Our statements, however, are equally applicable to schools of this kind; the inferiority complained of being, in their case, that of the teaching of commercial classes to that of the university classes in the same school. And there are certain circumstances observable in these mixed schools, which exhibit in the strongest light the power of the causes to which we have attributed the existing backwardness of middle-class education. One of these circumstances is the well-known fact that while classical students, as a general rule, work harder and harder according as their time for entering college approaches, the case is painfully reversed with the other students. As the end of their school-days draws nigh, they become, with few exceptions, less and less attentive to studies for which they fancy they will presently have little use. Another circumstance of a very suggestive nature is that, in almost all mixed schools, the general arrangements of the school are constructed principally with reference to the convenience and progress of the university classes, although these include usually but a small minority of the boys. The master may be very solicitous to do his duty by all the classes alike; but on the success of his head university class depends the character of his school, and it is but human nature that he should secure that at all hazard."

Dr. Shaw goes on to explain the plans adopted by the Society of Arts," and the plan of the "West of England Prizes for Practical Schools," remarking how fortunate the promoters of those prizes were "to have their ideas taken up by the Bath and West of England Society, an institution of high standing and influence," and "through its agency" (we may pardon the inaccuracy in the form of expression) "extended over the three counties of Somerset, Devon, and Cornwall." The Author proceeds to point out how the local efforts were incomplete till the subject was taken up by the Universities.

In submitting to parents in the middle ranks, for their serious consideration, the disinterested efforts of the Universities on their behalf, it should also be added, that it remains to be seen exactly how the University examinations will work; probably some supplementary local agency will be required for the good of the smaller middle-class schools, and this object must not be lost sight of.

The course of our introductory remarks has led us to speak of Science and of Art, of Education as well as of Agriculture. It will be no unfitting conclusion to quote from one of the most eloquent writers of the present day some stirring words as to the past and the future. Only we might alter his first words to suit our motto, and say "We, as we work and learn."

"We, as we live and work, are to be always thinking of those who are to come after us; that what we do may be serviceable, as far as we can make it so, to them, as well as to us. Then, when we die, it is the duty of those who come after us to accept this work of ours with thanks and remembrance, not thrusting it aside or tearing it down the moment they think they have no use for it. And each generation will only be happy or powerful to the pitch that it ought to be, in fulfilling these two duties to the Past and the Future. Its own work will never be rightly done, even for itself—never good, or noble, or pleasurable to its own eyes—if it does not prepare it also for the eyes of generations yet to come. And its own possessions will never be enough for it, and its own wisdom never enough for it, unless it avails itself gratefully and tenderly of the treasures and wisdom bequeathed to it by its ancestors.

"For be assured that all the best things and treasures of this world are not to be produced by each generation for itself; but we are all intended, not to carve our work in snow that will melt, but each and all of us to be continually rolling a great white gathering snowball, higher and higher, larger and larger, along the Alps of human power. Thus the science of nations is to be accumulative from father to son; each learning a little more and a little more; each receiving all that was known and adding its own gain. The history and poetry of nations are to be accumulative, each generation treasuring the history and the songs of its ancestors, adding its own history and its own songs; and the art of nations is to be accumulative, just as science and history are; the work of living men not superseding, but building itself upon the work of the past. Nearly every great and intellectual race of the world has produced, at every period of its career, an art with some peculiar and precious character about it, wholly unattainable by any other race, and at any other time; and the intention of Providence concerning that art is evidently that it should all grow together into one mighty temple; the rough stones and the smooth all finding their place, and rising, day by day, in richer and higher pinnacles to heaven." *

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* Political Economy of Art, by John Ruskin, Esq., p. 95.

(*Circular to Members.*)

SUBSTANCE

OF THE

REPORT OF A COMMITTEE

APPOINTED TO CONSIDER

THE EXPENDITURE OF THE SOCIETY

UNDER ITS DIFFERENT HEADS;

THE VALUE OF ITS SHEDDING AND OTHER PLANT;

AND THE MEASURES TO BE TAKEN TO

INCREASE THE ANNUAL INCOME

OF THE SOCIETY.

(*Presented 27th November*, 1857.)

THE accounts of the Society from the year 1852 to the present time have been carefully examined.

It appears that the gross expenditure, during five years, has amounted to nearly 16,000*l.*; and the balance against the Society is about 100*l.*

During the period referred to, large sums have been laid out in the purchase of shedding and other plant. Counting only what is now available, and allowing for annual depreciation, this plant is now worth 1500*l.* at least. To this plant must be added the poultry plant, worth 362*l.*, presented to the Society by Jonathan Gray, Esq.

Against the deficiency of 100*l.* in cash is therefore to be set a property in working stock, worth at least 1800*l.*, at the present time.

But this prosperous state as regards the past must not mislead the Society as to its prospects for the future. Its annual expenses have increased in proportion to the increased scale of the annual exhibitions, the efficiency of its trials, and the accommodation given to the public.

The income does not increase in proportion, notwithstanding the great number of new members.

After a careful examination of the estimate for the present year, it appears that a sum of 3387*l.* will be required to keep up the operations of the Society on their present scale of efficiency.

Of this sum 1880*l.* may be reckoned on from ascertained sources. If the yard receipts at Cardiff are equal to those at Newton, namely, 1300*l.*, the largest amount but one yet taken, the total receipts will even then fall short of the expenditure by 207*l.*; should the weather be unfavourable the loss will probably be much greater.

In order, therefore, to maintain the Society in full efficiency, it becomes necessary for the Council to take some step to increase its income.

The Committee call attention to the fact, that after giving a copy of the Journal (delivered gratis) and a free Ticket of admission to the yard to Subscribers of Ten Shillings, little, if any thing, accrues to its funds from their subscriptions; the Committee also state their belief, that many respectable yeomen subscribe only ten shillings, under the impression that that amount is the usual rate; and that many others do not subscribe at all, who only require to be canvassed in order to ensure to the Society their efficient support.

We, the undersigned *Members of the Bath and West of England Society*, beg leave to call the attention of our brother farmers and friends to the above statement.

Although we might, if we pleased, take advantage of Rule VIII., to be members on a subscription of only ten shillings, we have, nevertheless, either subscribed one pound from the first, or voluntarily raised our subscription to one pound: we invite our friends, *both in town and country*, to do the same; or, if they are not members already, to allow us the pleasure of proposing their names, in order to help us to keep up the credit and efficiency of a Society which confers so much benefit on agriculture and also on the trade of the West of England.

Thomas Hussey, Waybrook.
John Wippell, Exminster.
John Hooper, Chagford.
J. Webb King, Chilton Polden.
John Fry, Woodgates.
John Widdicombe, Ugborough.
Mark Farrant, Collumpton.
William Thompson, Bath.
L. J. Oldreive, Totnes.
William Wippell, Rudway.
R. May, Rewe.
Richard H. Pidsley, Sowton.
George Radmore, Junr., Upcott, Thorverton (new subscriber).
Samuel Kingdon, Thorverton.
John Palmer, Newton St. Cyres.
John Piper, Strete Ralegh.
A. Bodley, Bonhay.
W. Rendle, Coffinswell.
J. Ford, Creedy Park.
John Dinham, Exeter.
Pasmore and Savery, Exeter.
Josiah Hannam, Yeovil.
Samuel Pearse, Exeter.
Thomas Mitchell, Pinhoe (new subscriber).
William Butcher, Exeter (new subscriber).
James Howard, Alphington.
John Bodley, Stockleigh Pomeroy.
Richard Gibbings, Exminster.
Thomas Potter, Yellowford.
George Radmore, Senr., Courthayes.
William Roberts, Exeter.
Arthur Gregory, Montacute.
T. B. Miles, Langford, Bristol.
R. Bird, Newton St. Loe, near Bath.
T. Webber, Halberton.
J. Pitts, Drewsteignton.
Elias Ford, Newton Abbott.

*** Subscriptions may be paid to the Treasurers, R. Badcock, Esq., Taunton; or R. Dymond, Esq., Exeter; to the Secretary, H. St. John Maule, Esq., 16, Pulteney-Street, Bath; or to the Assistant Secretary, Mr. Roberts, Broad Gate, Exeter.

REPORTS AND PAPERS.

I.—*Report on the Implement Show at Newton.* By J. E. KNOLLYS, Senior Steward.

A VERY general wish having been expressed at the Newton Meeting that the Judges' Reports of the Implements tried by them should be made known at an earlier date than the publication of the Journal, the Judges and other gentlemen under whose superintendence the trials were conducted, kindly forwarded their notes for immediate publication by the Society. By this means full opportunity was given to all who are interested either in the use or in the manufacture of agricultural implements, to profit at once by the Newton experiments and by the opinions and suggestions of the Judges; and in this respect exhibitors at Cardiff will have an advantage not possessed by exhibitors at Newton, inasmuch as last year's Report and the suggestions contained in it were not in their hands till after their implements were in the Newton Show Yard.

The arrangements for the Newton trials were considerably in advance of former years. An additional day was given for the work, and besides this, as a means of saving the time heretofore occupied in selecting the implements for trial, exhibitors were required to deliver on the Friday evening at the steward's office a list of the implements which they wished to be tried. In addition to this extension of time, new appliances for ascertaining the draught or power taken by the various implements tested had been provided by the Society, in consequence of which a degree of accuracy and a certainty of result were obtained which, on previous occasions, had not been possible. Some notice of these new and ingenious instruments will be given in connection with the trials in which they were used, and therefore it need only be observed here that they were three in number, viz.—

A Dynamometer, showing the draught of Ploughs, Cultivators, &c., so arranged as to be applicable from 1 to 6-horse power;

An Instrument for ascertaining the power consumed by Horse-gear, independently of the machinery to which it may be attached; and

Mr. Froude's Dynamometer for testing the power taken by threshing and other rotatory machines.

In addition to these "Balk's Patent Brake" was kindly furnished by Messrs. Ransome for the steam-engine trials. The Society is indebted to Mr. W. F. Gooch, the engineer of the Locomotive department of the South Devon Railway, and to Mr. Edward Easton, of the firm of Easton and Amos in London, for acting as their engineers at Newton; to Mr. Caldwell of Hilborough, and Mr. Barker of Pusey, as Judges in the Yard; to Mr. Clare Sewell Read, of Barton Hall, Norfolk, and Mr. Chalcraft, of Bramshot, near Liphook, as Judges in the Field; to Mr. Druce, of Eynsham, Oxford, and Mr. Pitman, of Rumwell Lodge, Taunton, as Judges in the Miscellaneous department. These two last-named gentlemen supplied on a short notice the vacancy caused by the illness of our much-valued friend Mr. Nalder, whose absence was alike a subject of regret to the exhibitors at large and to the officers of the Society. It will, perhaps, render the Reports of the Judges more readily understood if the reader will refer to the List of Prizes offered and awarded at Newton, which is published with this Report. The prizes in the Classes from 1 to 20 came under the award of the Field Judges; from 21 to 41 under the Yard Judges, excepting Classes 30, 31, 32, 34, 38, and 41, which, together with the seven prizes in Section 5, came under the award of the Judges in the Miscellaneous department. The trials in the field were under the superintendence of Mr. Knollys, of Fitzhead Court; those in the Yard under that of Mr. John Gray, of King-Weston, Somerton.

Before passing to the several Reports kindly furnished by these gentlemen, it should be stated that the duties which fell to their lot were in every department more than usually heavy. At Yeovil it was a subject of regret that competition was in many classes but slight, but at Newton it is most satisfactory to notice that the entries for competition were generally very full, and that for the most part the implements brought to trial were of a thoroughly good and useful character. We had, however, to regret the absence of many leading firms, who from various reasons did not attend the Newton Meeting; but notwithstanding this, the energy of the West-country artisans had been so well applied, that not only was the exhibition itself larger than at Yeovil, but (with a few exceptions, among which steam-engines must be especially included) the quality of the implements shown was by no means inferior.* Having said thus much generally, it will be better that as to the particular trials the Judges should speak for themselves. They have in several instances very kindly given us an insight into the reasons of their judgment, and have also added suggestions which are well worthy of consideration; and though it can hardly fail to happen that these views will clash in some instances with those already entertained, yet opinions deserving so much weight are exceedingly valuable, and the Society at large cannot but feel under an increased obligation to these gentlemen for this additional information so kindly given.

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* The number of exhibitors at Yeovil was 97; at Newton, 100. The shedding occupied at Yeovil was 1827 feet; at Newton, 2202 feet.—J. E. K.

On the *Field Trials* Mr. Read and Mr. Chalcraft report—

"That the trial of field implements at the Bath and West of England Society's Meeting at Newton Abbot commenced with the ploughs. Instead of having two prizes as last year for heavy and light-land ploughs, one of 3*l*. for a general-purpose plough was substituted. This is a decided improvement: inasmuch as those great cumbersome ploughs which are so frequently exhibited at agricultural meetings very seldom find their way into the hands of the practical farmers.

"The trial-field was situated close to the town of Newton, and was an enclosure of grass-seeds in its second year. The land was of a fair average quality and stiffness, and the condition of the ground advantageous for good ploughing in consequence of the heavy rains which had recently fallen.

"Thirteen ploughs were taken to the field, but all were not worked in consequence of the non-attendance of the makers. The usual preliminary furrows were allowed for each plough to arrive at the depth of 5 inches. After a few turns at this depth the dynamometer was applied. The four ploughs that mostly distinguished themselves, viz. those of Messrs. Wright, Carson, Eddy, and Hole, were selected for deeper ploughing. Several furrows were then taken at 6 inches deep and 9 inches wide, and in conclusion the depth was 7 inches and the width 10 inches. The ploughs of Messrs. Hole and Carson, which had worked so well at a small depth, did not succeed at 7 inches; yet both are good and useful implements. Mr. Carson's is a nice little plough with one wheel, but it is very dear, the price being 4*l*. 10*s*. The contest was so close between Mr. Wright and Mr. Eddy that we could not satisfy ourselves which should have the prize, and therefore divided it. Mr. Wright's plough cut the best furrow, worked very steadily, and had capital workmanship. Mr. Eddy's plough was rather cheaper, and turned the furrow-slice in better style, leaving the land in a capital state for harrows. The dynamometer gave the draught as follows:—

	Furrows		
	5 in. by 8. cwts.	6 in. by 9. cwts.	7 in. by 10. cwts.
Eddy	3	4½	5½
Wright	3½	4	4½

This result puzzled us: we could not understand how the draught of two ploughs, so similar in construction and size, should vary at different depths. We observed that in going deeper Mr. Eddy's plough seemed to pitch on its point, and after the trials were ended and the award made, we learned that the pin for holding on the share became loose after the shallow furrows were ploughed, and that in order to prevent the share from coming off the maker deepened its pitch, which would account for the increased draught. This is satisfactory, and at once proves the correctness of the dynamometer. In addition to its being so portable and convenient its accuracy may be strictly relied on, and it is gratifying to know that the ploughs which made the best work were proved by such an efficient machine to be also very light in draught."

It will be well here to give some little description of this dynamometer, for the construction of which the Society is indebted to Mr. Belfield, Mr. Froude, and Mr. Gooch, and which admirably answers the purpose for which it was contrived. Mr. Belfield had previously given much attention and had very nearly perfected a plough-dynamometer for the use of the Society, which, for ploughs only, would, perhaps, have given the most complete record of the work done and the power used which has yet been invented; but as it was felt that a knowledge of the draught of other field implements as well as ploughs was essential in forming a judgment on their merits, he, in conjunction with Mr. Froude, suggested a plan which was very ably carried out by the Society's consulting engineer, Mr. Gooch, and which resulted in the handy little instrument which was of such essential use to us in our Newton trials. Mr. Belfield has at my request kindly sent the following description of it:—

"In conducting the trials of field implements entered for competition, a ready and efficient means of ascertaining the comparative weight of draught of each has long been found to be a great desideratum. Of existing appliances for that purpose, some from their size or complexity are unmanageable in practice; and even, strange as it may at first sight appear, the very accuracy with which they record the constantly-varying strain caused of necessity by the unequal hardness of the ground, is in itself an element of uncertainty in the result, as it tends to increase the difficulty of comparing the *average* working strain of different implements, which is the object sought, by complicating it with the varying texture of the soil, which is wholly beside the question. Other instruments again, which are of a more simple construction and not furnished with any recording apparatus, but simply with a graduated scale, on which is indicated the pressure at each moment, are from the same cause liable to such constant and rapid oscillations in each extreme, as to render anything beyond a guess at the *mean* pressure of the strain a simple impossibility. Another difficulty also arose, from the fact that no spring could be found of sufficient strength to sustain the pull of four horses, combined with such readiness of extension as would give also, on an adequately open scale to be of practical utility, the results of single-horse implements, which consequently involved the employment of more than one to meet each case successfully. The desiderata therefore are, simplicity of construction, with such adaptation of parts as would render the same dynamometer suitable for implements of all descriptions, and that without reference to the number of horses employed; and also such mechanical means as would prevent those oscillations of the index which were due to the soil rather than to the implement under trial, and would cause the average pressure, which alone is the true measure of draught, to be approximately, if not accurately, shown by the instrument itself without the labour and difficulty of subsequent calculation.

"In the absence of a drawing to represent the instrument, which was finally adopted with a view to the above, and which was found to be perfectly efficient, no exact notion can be given of its form, though the principles involved in its construction may readily be comprehended and may be described as follows:—In order to meet the first difficulty as to the spring and to render the dynamometer applicable to all cases, a direct pull was no longer taken from the spring itself but from a beam in the nature of a steelyard, which was hooked to the plough or other implement under trial, and the spring applied to it in the place of a weight, so as to show on a graduated scale by its extension the degree of force applied. On this beam three notches were made in such positions that 1 cwt. on the first, 2 cwt. on the second, and 4 cwt. on the third would cause in each case a precisely similar extension of the spring, and the reading upon the scale be in each case therefore identical. The horses then being hooked on to the first, second, or third notch, according as one, two, or four were employed, the spring of course would be equally effective in each case, and it is only requisite to multiply the reading shown upon the scale, by two or four, according as the pull was on the second or third notch in each instance, to obtain the correct result. The other point, viz. averaging the strain applied, was obtained by the introduction of a small brass cylinder (technically termed an oil-cylinder), closed at each end, one of which is furnished with a stuffing-box, through which a rod passes to a piston within it of somewhat less size than the interior of the cylinder itself, and which apparatus is connected with the steelyard-beam in such a manner as to preclude the possibility of any extension or contraction of the spring without a corresponding movement of the piston in the cylinder. This cylinder being then filled with oil, which is confined within it, it is clear that no motion of the piston can take place without the oil passing from one side of it to the other through the small space left between it and the sides of the cylinder, and the rapidity of motion of which the piston is susceptible, under a given pressure, is clearly dependent on the size of this space and the freedom with which the oil is allowed to pass. By regulating this, then, we have the means, as it were, of putting a drag upon the piston, and through it on the motions of the spring, which may thus be rendered insusceptible, to any extent required, to sudden and momentary changes of force, which are consequently effectively eliminated from the result shown upon the scale, which therefore gives a practically true average of the measure of force applied, or, in other words, of the actual draught of the implement under certain and previously ascertained conditions; and these being the same in each trial of the same class of implements, the difference in their draught may be at once taken from the scale without the necessity and labour of any subsequent calculation."

Continuing their Report on Ploughs the Field Judges say—

"Mr. Dray exhibited a French novelty in the shape of a steeled bar which projects beyond the share and forms its point. This invention seems likely to do away with the objection to cast-iron shares on rocky land. The points constantly break off, and then the shares are useless, so that on such soils wrought-iron shares are still generally used. Mr. Dray's bar is firmly fixed in the body of the plough, and can be readily removed or pushed forward in case a portion of the point is broken off. We need hardly observe that fresh steeling the point is a matter which any country smith can cheaply and quickly perform. The plough with the steeled point made bad work at the trials, and in taking a furrow of 5 inches deep had a draught of 4½ cwt., so that it had no chance of a prize; but to direct public attention to the wrought steel point, and also to show our opinion of its worth, we awarded it a certificate of merit.

"The *subsoilers* were tried after the general-purpose ploughs, which had turned a 6-inch furrow. They were set to stir the land to the depth of 6 inches more. Mr. Bentall received the prize. His subsoiler is the beam of his broad share, and is fitted with a point, and also with shares that cut all the land. The report of last year states that these shares were not then used, and adds, 'if one had been on, the plough might have received more than the commendation it obtained.' The result this year confirms that opinion. It moves steadily, and has a light draught. Mr. Eddy's Tweeddale subsoiler mixes the soils as well as cuts all the furrow, but it requires a great amount of horse-power to move it. Mr. Pitt's plough is very cheap, and has the easiest draught. Its share did not cut quite all the land, nor did it run so steadily as Mr. Bentall's. We had much pleasure in highly commending it.

"Mr. Eddy exhibited one of the best *turnwrest ploughs* we ever saw. It is well made, easily adjusted at the ends, and with its two mouldboards, and skim coulters, costs but 5*l.* It was tried on some sidling ground and made really excellent work. In turning a 6-inch furrow *uphill* it registered a draught of only 3¼ cwt. We had not much trouble in awarding the prize, as the only other competitor made very indifferent work.

"There was no improvement to record among the *scarifiers.* The best were precisely similar to those of last year. Messrs. Hart and Gibbon's was the most useful fresh one that was tried; it is a good scarifier, but does not shine as a parer. All the cultivators were tried with their broadshares on the field of ley. The scarifying was across the land that had been ploughed on the Saturday trials. Mr. Coleman's pared very evenly and well, and so did Mr. Bentall's. The draught was in favour of the former, and in scarifying his work was superior. Then, on the other hand, Mr. Bentall's price is greatly in his favour, and the beam of the broadshare can be used as a subsoil plough. Both being such good implements, and both having their respective merit, we thought it better to divide the prize for wide cultivators between these two worthy competitors. In the narrow cultivators Mr. Coleman secured the prize, as his scarifying was so superior to Mr. Bentall's. This must be the case. In the wide implement, seven tines, tipped only with points, will be sure to move the land more evenly than five can do it. But the advantage is more conspicuous in the smaller one, for there three tines stand but a poor chance against five. Indeed Coleman's narrow scarifier is a capital implement for a pair of horses, and it has hardly a fault, save its great price. All cultivators may disappoint a man who expects too much of them; they are capital harrows but very poor ploughs. They may often save the cost of that expensive operation, but if a scarifying is given where a good ploughing is needed the result may be unsatisfactory, and yet the fault does not rest with the scarifier, but with the over-sanguine farmer, who thought that one implement would cultivate his farm. We tried a light-land scarifier of Mr. Collins's, which worked famously. It effectually stirred all the land on the field where the narrow cultivators were tried, and on being taken to the heavy soil, it tore through the newly ploughed ley ground, and by its peculiar elasticity of motion did not once clog. Still we think on very foul ground the frame is so *low* that the loose grass would soon check its progress. It was not provided with its broad points, but we were so pleased with the light and effectual manner in which it worked that we awarded it an extra prize of 1*l.*

"In last year's Report the judges expressed themselves at a loss to distinguish a set of *drags* from a set of *heavy harrows.* The Society, to help us out of the difficulty, has this year offered prizes for a *pair* of drags and a *set* of harrows. But the drags we saw were nothing more than two heavy harrows, and did not come up to an idea of a drag, which we consider a sort of hybrid implement between a scarifier and a harrow. Bentall's were the heaviest and the dearest, but they jumped much on the rough land. Eddy received the prize, and Jewell well earned his commendation. The heavy harrows were generally very good implements and made excellent work. We could not satisfy ourselves which were the better set, those of Messrs. Fry or Eddy, and so divided the prize. Mr. Comins' seed-harrows were successful, and Mr. Eddy's left the ground in a very nice state. The wooden harrows exhibited by Mr. Boastfield worked lightly, and having plenty of play, seemed well calculated to shake out and separate root-weeds from clods. But surely wooden harrows are 'penny wise and pound foolish:' they cost less at first, but very much more for repairs, and in the end (which comes quickly enough) are good only for the fire, while iron harrows, when used up, are always worth a considerable sum for old iron. We do not see much advantage in Messrs. Hill and Smith's cast-iron harrow-teeth; they must soon become blunt, and there can be but little good resulting from putting in a fresh tooth when an old one is broken, for the new comer must find himself longer than any of the half worn-up set. They are doubtless of great value to emigrants.

"Mr. Cambridge's *chain-harrows* were quite new to us. We have been accustomed to regard a harrow as a large rake. In these united chains of Mr. Cambridge's there are no sort of teeth, so we should prefer calling them pulverizers rather than harrows. But the name is of little moment. They worked very nicely, and appeared admirably calculated to bruise and divide small clods. They gave the land too much of a brushed appearance, producing a very even surface. Their price is high (6*l.*), and we question how long the angles of the chains will wear, especially on stony land; and when a few links go a dissolution of the whole must quickly follow. Two sets were tried: one in which the net-work of chains was kept open by sticks; in the other a row of stiff links produced the proper expansion. The latter seemed the better contrivance, and that set gained a certificate of merit.

"Mr. Carson has wonderfully improved his *clod-crusher*. Last year there did not appear the remotest probability of cleaning it, for the shape of the discs precluded the possibility of scraping it. However, it is this year, by the introduction of alternate loose rings, made self-cleaning, and it did its work remarkably well. We would remark that we are by no means sure that these self-cleaning actions do not produce much more friction, and also add materially to the draught. Patterson's clod-crusher is a most perfect pulveriser of rough ground; but Mr. Eddy's roller seemed more generally useful, being a fair crusher, and also the best presser of ley ground. We never remember seeing Mr. Cambridge's celebrated rollers show to so little advantage.

"In *corn-drills* Mr. Holmes took the first prize, and Mr. Bowhay the second. In the next class, that 'for the drill best adapted for small occupations in hilly districts,' the one exhibited by Mr. Holmes, the invention of J. Belfield, Esq., requires a little explanation. This drill, which was, in the first instance, constructed by the inventor with a special view to the steep hill-sides of Devon, and to the pockets of those who cultivate them, has been designed with particular attention to simplicity of construction, lightness of draught, and a method of steerage which shall effectually counteract that tendency of the hinder part of all other drills to slide down the side of a hill when drawn horizontally along it, which throws the hind coulters out of their proper track to an extent that entirely deranges the distances between the drills. The two first objects have been obtained by discarding the use of cups for the delivery of the seed, with the machinery necessary for preserving the level of the seed-box, and using in their place rollers, having on their circumference indentations of a peculiar form, with metal scrapers, which regulate the delivery of the seed, and which are arranged with counterbalancing weights, so as to permit of the passage of any foreign substance which may have become mixed with the seed, and readjust themselves after it has done so. Single seed-tubes, with an india-rubber joint, take the place of that series of tubes and funnels which in ordinary drills conduct the seed to the coulters. The steerage is effected by giving to the iron axle of each wheel a few inches' play round the bolt which usually unites it to the wooden axletree close to the back of the wheel, the inner end of each axle being furnished with a rack of a segmental form. Both these racks gear in a small pinion which is placed between them in the centre of the axletree. This pinion being arranged so as to be readily turned by a worm-wheel and screw from the back of the drill, the wheels can, by one or two turns of a handle, be set by the man in charge to point up the hill to exactly the same extent that the drill has a tendency downwards, which is thus entirely counteracted, without in any respect interfering with the position or direction of the drill. This method of steerage is, of course, equally applicable to level lands, and, independently of its economy and simplicity, is free from many of the objections incident to the fore-carriage mode; and the simplicity and low price of the implement itself puts it almost beyond the possibility of derangement, and brings it within the reach of the most limited means. . . . .

"We think this drill admirably adapted for hilly ground. The corn-box being divided into small compartments must prevent the mass of grain from shifting, and the substitution of the metal box for the cups in the delivery of the corn must secure a regular vent for the seed. The grain by its gravity must find its way to the hollows of the little revolving boxes, and, being once there, it cannot slip off however steep the hill-side may be. This drill struck us as the most useful improvement the Newton Show produced ;* it, of course, took the first prize : the second was withheld. Before quitting the subject of hill-sides, we would make one observation on Mr. Holmes's contrivance for counteracting the difference in the speed of horses going up and down hill. It is by having two wheels on the drill at once—one with two cogs less than the other; and this, of course, is used in going up hill, while the larger wheel drives the spindle in descending. If all hills were regular in shape and elevation, and all horses walked at the same pace, then this ingenious contrivance might do; but as hills are mostly irregular, and horses' paces by no means equal, we fear it will not answer the desired purpose. Mr. Heard exhibited a new mode of taking a drill out of gear. Instead of lifting the box off the nave-wheel in the old way, the process is performed in the centre of the seed-box, by shifting the wheel which turns the spindle. Now we hope we shall always hail a useful novelty with pleasure, yet we feel we should not be doing our duty to the public by commending every new thing. It is poor policy to advocate a change simply because it is a change. And the old way of taking a drill out of gear at the land's end we have never found inconvenient. The corn-box of a modern drill is never heavy, and the lever-power of the handle makes the operation quick and easy. The driving-wheel, by being placed at once upon the cog-wheel of the nave, communicates the motion direct to the spindle without any complexity or loss of power. In Mr. Heard's new invention, we admit, there is much ingenuity displayed, and the workmanship is perfect. But it entails four cog-wheels, two bevel gears, and long iron rods, and by all these the spindle is turned. Any one of these being out of order would stop the drill; and when it is considered that the whole motive power is given in this roundabout manner, some disarrangement of the complicated parts is very probable. The quickness with which a drill can be stopped by this means is very good, but we object to the position of the handle. It is in the centre of the drill, and takes up a portion of the space in which the cups should work. We prefer it at the side, for there the drill-man should walk, and he must go there to take up his coulters. Another feature of this drill appeared to attract much attention. The contrivance for levelling the seed-box on hill-sides was well made and well oiled. Parties seized a little handle, and were delighted at the celerity with which they could pitch the seed-box up or down. The very same means were employed on many other drills in the yard, but paint and varnish, and a greater solidity of construction, prevented their working so nicely.

"A great many *turnip and manure drills* were entered for competition, but as the prize was only for such machines as could drill on the flat as well as on the ridge, the number for trial was reduced to three. The first prize was taken by Messrs. Reeves for a new drill of their invention. At the bottom of the manure-box is an Archimedean screw which, in its revolutions, turns the manure through the holes in the bottom, the quantity being regulated by slides. This much simplifies the operation. The manure (instead of having in the old way to pass from its box to the compartment in which the cups or prongs revolve, there to be taken up by them and turned or scraped into the tins) at once escapes from the box in which it is first placed and falls into the coulter. We do not wish it to go forth that because this drill received the first prize, therefore it is *perfect*. We do not like cast-iron wheels, especially without bands; we think the manure-box too small, and not strong enough at the bottom long to resist the crushing action of the screws; and a stirrer in the upper part of the box to be worked when wanted, by hand, would prevent the manure when tightly rammed from sticking at the top. Some sort of *index* for the slides is also wanted to regulate the quantity of manure. But the drill is simple, cheap, and efficient—all qualities for our special commendation. Messrs. Holmes have applied the principle of their manure-distributor to their drills, and thereby insure greater accuracy in the delivery of the manures. It gained the second prize, being in all respects a well-made and useful machine. Mr. Bowhay's drill is of the old-fashioned sort. It will sow a large quantity of manure regularly and well, but it fails when it comes to distribute a small dressing, particularly if it be damp. What we want to know is, not how *much* a drill will deliver, but rather how *little*. Very large quantities of ashes or such like auxiliary manures will hardly pay for the trouble of passing them through the drill. Our own idea is that a drill that will well sow from 2 to 30 bushels of manure per acre is the sort of machine most wanted. We must not pass on without a slight notice of the ridge-drill of Mr. Fisher. The arrangement for changing the seed appeared capital, and it is also a good plan that the manure-coulters should precede the concave rollers. If the ridge be ever so evenly rolled, a heavy coulter rushing through it soon destroys all its regularity of form. 15*l.* is a good bit of money for a two-row drill applicable only for one purpose, and we question if it is well adapted for sowing moist manures.

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* Mr. Holmes promised to send me a drawing of this drill for publication with this Report, but it has not arrived in time. I regret this, as it would have materially tended to explain its principle and the details of its make.—J. E. K.

"There was rather a curious prize offered for 'the best *general drill*, capable of distributing *at pleasure liquid manures* with the seed.' We thought that in a water-drill the cistern for the liquid was the great and indispensable feature. But we have since seen a drill from which the water-works can be removed at pleasure; this would have met the requirements of the Newton prize, the wisdom of which qualification we much question. As there was no drill in the yard which properly complied with the terms of the prize, with the permission of the Steward, we gave the 5*l.* to Messrs. Reeves for Chandler's liquid-manure drill.* Mr. Chandler has invented a drop to his drill. This is formed in the coulter. A wheel presser runs before the coulter, and in this mark the manure, water, and seed are dropped together in bunches. But dropping water into a *groove* is surely a means of converting it into a *stream* if much liquid is applied. A firm seed-bed is desirable, but the pressure need be only just under and around the bunch that is dropped.

"The *manure distributors* tried were three in number. Mr. Holmes's has now been so long before the public and is so well appreciated that it need not be described here. It worked well; delivering some sandy earth, as wet as fresh mortar, with great regularity. Messrs. Reeves' new distributor, formed on a like plan to their drill, received the second prize. This also distributed the manure well, and is very simple in its construction. That simplicity should also secure cheapness, but this machine, which is nothing more than a deal box with slide holes and a revolving screw, with wheels, axle, and shafts, was priced at 10*l.* Mr. Bowhay's distributor is like his Yeovil prize machine; it has a good barrel for delivering the manure, but, as was observed last year, the upper box wants another stirrer. With regard to *spring scrapers*, we would express doubts similar to those recorded in the Yeovil Report, whether, when long used with such corrosive manures as guano or salt, they would not lose their elasticity.

"There was no great improvement in the *horse-hoes*, and we saw but one really adapted for the flat, as none of the other hoes could take two drills at once. We believe that a hoe on the flat which will cut one drill and two halves has a better chance on level ground of working easily and steadily than a hoe taking a single drill. And a man and a horse (with a boy in some instances to lead it) to move a foot and a half of land an inch deep is a slow mode of doing very light work. In our opinion we do not possess a real good turnip hoe for the flat. Garrett's is too expensive and too heavy for one horse. We want one, cheaper and lighter, that will take 2 or 3 drills, but *each hoe should hang on a lever*, or the least inequality of the ground will throw some of them out. All those now fixed on a bar are, from this cause, constantly slipping over some of the weeds, while in the next drill they may be rooting 3 or 4 inches into the ground. Levers would obviate this. There were several little harrows behind the hoes to stir the land after it is cut; this is the chief advance since last year, as nothing of their sort was shown at Yeovil. Mr. Carson again took the prize. His implement works steadily, cuts and raises all the land, and will enter any soil however hard. It is well made and well adapted for working among large turnips, as the frame is low and narrow. It has one serious fault—its dearness, a failing which appears to infect all Mr. Carson's implements. Its price is 3*l.* 10*s.*, which is really too much for a single horse-hoe.

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* Mr. Chandler's drill approached the terms of this new prize more nearly than any other, but should the Society again offer a similar prize, it is hoped that an effort will be made to comply more closely with its conditions.—J. E. K.

"We did not make any award in the class of *horse-hoes specially adapted for hill sides*. Last year the prize was given to one that simply altered the line of draught. This was considered a step in the right direction, but by no means all that was required. At Newton no further improvement was brought forth; and as we thought that the Society expected that something more should be produced than what was shown at Yeovil, we, with the concurrence of our steward, withheld the prize.

"The *machine for setting out turnips*, exhibited by Mr. Eaton, was too slightly made to cut steadily or make even work, but there seems reasonable grounds for supposing that, as it had never before been tried, it might be easily improved and become a useful implement: so, in the absence of other competitors, we awarded him the prize. Mr. Eaton also showed a double hoe, but one row of turnips is enough to chop out at once, especially if the side-hoes for scraping the ridges are used. Shafts would probably steady this machine.

"Last year a prize was offered for *a machine for filling up vacancies in drilled green crops*, and also one for a hand-dibble for a like purpose. At Yeovil there was no entry for either of these prizes, but at Newton, though the second prize was withdrawn, there were four entries for the first. Mr. Eaton showed a dibble which was more suited for grain than for smaller seeds. Mr. Cambridge and Mr. Holmes both exhibited a useful little implement with which a boy can fill up the vacancies in several acres in the course of the day. Mr. Cambridge's had the advantage of a little rake to cover the seed: to that we gave the prize; the price is only 7*s.* 6*d.*, and we think no farmer should be without one.

"Mr. Bowhay has improved his *Reaping-machine* by having the gearing portion of his driving-wheel inside instead of out; in other respects the machine was unaltered save that the price was raised from 18*l.* to 20*l.* on account of superior workmanship: it well sustained the signal success it acquired at Yeovil. It cut a large quantity of rye in capital style, and we think the knives of this machine quite equal, if not superior, to any that we have seen. There are two sets of knives, one of which moves, and it appears reasonable that it should be easier to cut the straw between two sharp edges than to dash it off against a lot of blunt guards. The delivery depends very much on the man who works the machine; and we think the application of Mr. Dray's tilting-platform would be a great improvement to this machine. We ought to add that Mr. Dray's reaper was in the Yard, but it did not appear at the trials; doubtless the proprietor remembered the decisive defeat Mr. Bowhay gave him at Yeovil.

"The prize offered for *Horse-rakes* had the condition that they should be more or less self-acting. Of the ten entered for trial three only were found that in any degree complied with that condition, and of these one became disarranged at starting and the others made very indifferent work. We gave the prize to Marychurch's self-acting rake, which was shown by Mr. Webber. This simple contrivance is likely to become extensively adopted, but we doubt if it will act well on very heavy crops or when the rake is over full.

"Mr. Coleman showed Hanson's *Potato-digger*. This is a large and expensive machine. A share made somewhat like a spoon runs under the row of potatoes and lifts them up, while a set of forks, having a quick rotatory motion, dash out the potatoes on one side. We had a sack of potatoes deposited in two furrows and earthed up: the digger soon exposed them to view; and when it was set at the proper depth seemed to throw the whole on the surface. Although this machine will only answer with extensive potato-growers and where labour is scarce, we thought that for novelty of design it was justly entitled to a Certificate of Merit.

"Our attention was called to Mr. Wood's *Weed-extirpator*. This implement received a Commendation of Merit at Yeovil, its dearness being censured by the Judges. As the price is, if anything, increased, we thought it would be bad policy to again commend an article whose success appears only to enhance its already extravagant price.

"Mr. Rousell's cheap and excellent *Hay-collector* was again tried. It worked as well as ever, and it once more received an extra prize.

"We had much pleasure in giving Mr. Heard a Commendation of Merit for his Bickford *Irrigation-plough*. It cut the water-gutters with great precision, and it must be of essential service on meadows formed on Mr. Bickford's system.

"A not unnatural impression has gone abroad that, because some of the great implement-makers did not exhibit at Newton, therefore the show of implements was poor and the trials unsatisfactory. No such thing; of course we are only speaking of our own department, but in so doing we can confidently assert that the trials were quite as satisfactory to us as any we have superintended at the Royal Meetings, and that the successful implements were in every way worthy of the prizes they received. Again, the Newton trials were a marked improvement over those at Yeovil. The competition was keener and more general, and the Judges had also more time, a better dynamometer, and greater facilities for conducting the trials. At Yeovil the class of drills was badly represented in the prize list, but Mr. Holmes no longer stands aloof, and this year exhibited for competition as good a lot of drills as any one can produce, and which in size, construction, and price are well suited for the western and hilly districts of England. The farmers of Devon do not want to run across the kingdom for their ploughs. The turnwrest plough exhibited by Mr. Eddy is, as we have already observed, the best and cheapest of the kind we ever saw, and the general-purpose plough by the same maker, and also that of Mr. Wright, are as well constructed and work as lightly as the most fastidious amateur could desire. The subsoilers, harrows, clod-crushers, horse-hoes, reaping-machines, and rakes of the local makers, are excellent, useful, and carefully made implements; and though the Essex men still carry off the palm in cultivators, they have the good sense to compete at these trials, and Mr. Collins' little scarifier presses them hard. In steam-engines it may be that the East excels the West, but for field implements the local makers that exhibit at the Bath and West of England Society's shows need not fear any rivals, and from the rapid improvement they have made —which year by year these exhibitions so ably develop—they bid fair not only to supply their own neighbourhood but to draw customers from distant counties. We only trust that they will not rest content with their present success, but that it will stimulate them to increased exertions.

"It is about as general for Implement Judges to conclude their Reports with thanking the stewards or somebody else, as it is for public meetings to offer a similar compliment to their chairman. But in tendering to the steward of our department our warmest thanks, we hope that such will not be regarded as an empty compliment. Not only was every arrangement in the Yard and Field superintended with great ability and zeal, but the comfort and convenience of the Judges were at all times cared for. Instead of having, as at some meetings of other Societies, to rush about a crowded town to secure an out-of-the-way loft in which to repose our wearied bodies; and instead of having to meet by stealth in some corner of a boarded office, and there among coats, umbrellas, and washing-basons to huddle together and transact our business; at Newton we were provided with comfortable private lodgings, and there had ample opportunity, after the toils of the day, to arrange our notes and enjoy the society of our brother Judges. In addition to all this the personal kindness of the stewards, their powerful assistance and constant attention, will long be held in our grateful remembrance.

"Judges have sometimes been accused of indifference in making their remarks, and carelessness in offering their suggestions. They knew from bitter experience that such recommendations were but little regarded, and it was therefore not of much importance what they said: however, the Judges of the Bath and West of England Society are really encouraged to be communicative, and should therefore be careful what they recommend. On looking over last year's Report we find that all the hints there thrown out have been courteously received by the Council, and what is more, they have been actually carried into effect. This is very gratifying to the Judges; and we think that the alterations from last year have not been without their good effect on the success of the Newton Meeting.

"William Chalcraft.
"Clare Sewell Read."

Turning now to the *Yard Trials*, Mr. Caldwell and Mr. Barker say:—

"In writing a Report on the Trials of Implements in the Show-yard at Newton, the Judges have a long task to perform, owing to the great number of machines exhibited, and also the difficulty they felt in having to judge of implements, when so many of the leading makers and their machines were absent.

"This we deeply regretted, emulation having done so much to improve implements, and having brought forward so many manufacturers who (without the Royal Agricultural Society and their system of conducting trials up to the close of the meeting at Carlisle) would in many cases have remained unheard of, and in others would never have obtained the celebrity to which they have risen. For instance, the Senior Steward, in his Report of the Lincoln meeting, says (speaking of machinery for threshing and dressing corn):—

"'The Report of the Engineers and Judges fully establishes the fact, that the labours of the Agricultural Society have been eminently successful. Indeed, I may here observe that improvements, I do not say inventions, are, for the most part, suggested by the failures which occur when machinery and implements are brought to the severe test of a public trial.'

"We must, however, own that the agricultural interest owe to the implement makers their best thanks, and at the same time not forget that the anxiety of farmers and others to obtain good implements first caused them to exercise their greatest powers to obtain pre-eminence in their several callings.

"Having said thus much, we will now proceed with our business connected with the trials at Newton. When we first entered the Show-yard on Saturday morning we were greatly surprised by the extent of the yard (15 acres), and the beautiful arrangement of the sheds (en échellon). After selecting the implements for trial we hoped to commence at once with the steam engines, but the dynamometers had to be arranged, and owing unfortunately to the illness of Mr. Froude, that excellent dynamometer, invented and for the first time brought out by him, could not be used until he was conferred with.* On Monday morning, June the 1st, all was ready, and we commenced with steam-engines, being most ably assisted by Mr. Edward Easton and Mr. Gooch, of the South Devon Railway, to whom, as the Society's engineers, we leave the Report on these trials. We beg to observe, however, that, owing to the length of time required to raise steam to 50 lbs. by the several engines, and the great complaints made by the makers with regard to the quality of the coals and wood, we determined, when an old engine of Hornsby's (which had been kindly lent to the Society by Mr. John Gray, of King Weston, for the purpose of testing the power required for several machines, through the dynamometer) was at liberty, to try its powers of raising steam, and in spite of a very wet night, which completely soaked the wood and the coals, steam was raised to 50 lbs. in 42 minutes. We gave the second prize to Maggs, and commended Mr. Cambridge's engine."

Mr. Gooch on making his Report on these steam-engine trials at Newton says:—

"The Trials of the Steam Engines at the meeting held at Newton in June last will hardly bear comparison with those made at Tiverton in 1855, as you will see by the annexed tabular statement, giving the result of each trial. The principle of conducting the trials was the same as at Tiverton, and the same brake was used. I will deal with each engine in the order in which they were tried.

"1st. Mr. W. C. Cambridge, 8-horse engine. By referring to the tabular statement it will be seen this engine took 91 minutes 40 seconds to get up the steam to a pressure of 45 lbs. on the square inch, but shows a fair result in the consumption of fuel per horse-power per hour. It is a good and useful engine.

"2nd. Mr. Oliver Maggs, 8-horse engine. This engine also took a long time to get up steam (98 minutes) to 45 lbs., at which pressure it barely maintained its speed, and on getting at all below this pressure the speed fell rapidly. The average pressure during the trial was 50 lbs. on the square inch. The amount of fuel consumed per horse-power per hour was low, and the general result of the duty done entitled this engine to the first position, but being considered only a second-class engine, the second prize was awarded to it. The principle of the construction of the boiler (viz. with return flues) I do not consider so good or simple as the tubular boilers, similar to those made by Messrs. Hornsby and Co.

"3rd. Messrs. Brown and May, 6-horse engine. This engine took 150 minutes to get up steam; this *excessive* time was caused in a great measure by the area of the fire grate being too much reduced by fire bricks being put on the top of the fire bars, round the side of the fire box. The pump of this engine failed, and the trial was discontinued. I had pleasure in observing that in the construction and workmanship of this engine there was a great improvement as compared with the one which they exhibited at Tiverton, and had these bricks not been put in the fire-box, the pump kept right, and the trial completed, I think the result would have been good.

"4th. Messrs. Holmes and Son, 4-horse engine. This engine took a much less time to get up steam, but the consumption of fuel per horse-power per hour was excessive (*see* Table).

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* For an account and explanation of this ingenious and valuable instrument, see Mr. Froude's paper in the last volume of the 'Journal.' It only remains to be added, that, after its efficiency was fully proved at Newton, it was most liberally presented to the Society by Mr. Froude.—J. E. K.

"5th. Mr. George Parsons, 7-horse engine. This was a good useful engine, but, like the rest, took a long time to get up steam; the trial was discontinued in consequence of the pump failing.

"It was alleged by the respective manufacturers that the length of time required to get up steam arose from the quality of the fuel supplied them, which was the best Merthyr steam coal. The judges and I being of opinion that there was no fault in this respect, and wishing to prove to the exhibitors that such was the case, determined on trying an 8-horse engine of Messrs. Hornsby's make, which had been at work for two years, and was then employed by you for testing the threshing machines. This was accordingly done, and under unfavourable circumstances, inasmuch as there had been a great deal of rain during the night, and the wood and coal consequently very wet; but notwithstanding this the steam was at 45 lbs. pressure in 42 minutes 45 seconds, thus showing that the fault was not in the coal but in the construction of the engines, and that there is great room for improvement in this respect.

"Table of the Results of Trials of PORTABLE STEAM-ENGINES.

Name of Maker.	Horse-power.	Time in getting up Steam to 45 lbs.		Coal used in getting up Steam.*	Coal burnt per Horse-power per Hour.	Coal per Day of 10 hours, including Coal used at*	Cost, the price of Coal being 21s. per Ton.
		m.	sec.	lbs.		lbs.	s. d.
Cambridge . . .	8	91	40	42	6·204	538·32	5 0¼
Maggs	8	98	0	40	5·26	460·3	4 3¼
Brown and May .	6	150	0	Broke down; feed-pump failed.			
Holmes	4	54	0	29·25	12·5	589·25	4 11¼
Parsons	7	99	0	Broke down; feed-pump failed.			

"I must not conclude this without expressing my great appreciation of the valuable assistance rendered me by Mr. E. Easton during these trials.

"I have the honour to remain
"Yours very sincerely,
"WILLIAM F. GOOCH."

It is evident from this Report that there is much to be done in the way of improvement by all these makers of steam-engines, if they would hold a high place in public estimation; and as it has been well said that more is often learnt from failure than success, we may hope that the low standard of merit here attained will be materially raised in the course of another season.

Much disappointment was felt by many of our Devonshire friends that an engine made by Mr. Webber, of Newton, owing to an unfortunate accident, was not completed in time for trial. There was naturally much interest attached to the production of the first portable engine made in the county, and to the position it would hold when subjected to the Society's tests. Its absence from the show-yard was also more to be regretted as there seemed a strong expectation that it would have done Mr. Webber much credit, while, possibly from his attention having been much given to this new branch of business, he did not meet with his usual success in carrying off other of the Society's prizes. Continuing the Yard Judges' Report, we find that—

> " Alternately with the trial of steam engines we tried the 'Portable Combined Steam Threshing-Machines that would best prepare the corn for market.' Their several merits may be seen by the subjoined Tables. We were not satisfied with the complete marketable state of the grain (wheat), so we had what we considered the best sample from one of the three machines under trial, subsequently dressed by hand-power, and found it very far indeed from finished. We must add (as has been stated in a former Report) that great difficulties have yet to be contended with by the makers to bring before the public a perfect portable threshing-machine that will thoroughly prepare the corn for market. The machines tried at Newton did their makers great credit, but their size and weight were sad objections; for although it was said 'they are not so heavy as you may imagine,' we all know that wood and iron, if put into them for strength and durability, are no lighter in one position than another; however, the public have asked for such machines, and the makers deserve great praise for the high state of perfection to which they have brought them, and, in these trials, Mr. Humphries, whose machine worked well and very steadily, and is economical in price as compared with the others, is especially to be commended. It was strictly examined by the consulting engineers, and in every part appeared well constructed. We gave Mr. Humphries the prize. Messrs. Hart and Gibbons we highly commended, and also commended Mr. Cambridge.—See Table I.

" CLASS 22.

" TABLE I.—For the PORTABLE COMBINED STEAM THRESHING-MACHINE which will most perfectly prepare Sample for Market.

Trial with 100 Sheaves of Wheat.

Name of Exhibitor.	Nominal Horse-power.	Real Horse-power.	Time in Minutes Threshing 100 Sheaves of Wheat.	Horse-power consumed if Threshed in 1 Minute.	Clean Threshed.	Clean Shaken.	Chafings free from Corn.	Chaff free from Corn.	Corn Unbroken.	Straw Unbroken.	State of Marketable Sample.	Comparative Merit.	Price.
Perfect Work represented by . . .					15	15	12	12	15	15	12*	96	
			Min.										£.
Cambridge . . .	8	9·424	5·376	50·663	15	11	12	12	14	12	7	83	120
Hart and Gibbons	8	9·78	4·56	44·396	15	14	12	8	12	14	8	83	120
Humphries . .	8	7·524	8·32	62·600	15	14	12	12	14	15	9	91	93

Barley, 20 Sheaves.

Cambridge . . .	8	7·631	4·24	32·355	15	12	8	8	14	..	..	57	120
Hart and Gibbons	8	7·214	3·616	26·085	15	11	12	..	12	..	..	50	120
Humphries . .	8	6·488	4·48	29·066	15	13	7	12	12	..	..	59	93

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* This column, showing state of sample, was subsequently added by the Judges at my request. They state that none of the samples were fit for market. From this it would seem that as at present the finishing dressing machine cannot be dispensed with, the machines of less power and cost, represented in the next class (23), are as yet the most serviceable.—J. E. K.

"Class 23.

"Portable combined Steam Threshing-Machines not exceeding Six-horse Power.

"We had an entry as follows:—Brown and May, Cambridge, Holmes, Humphries, Maggs, Webber. In these trials Mr. Humphries was decidedly very superior. Mr. Webber's failed to work, his machine appearing very weak in all the material working parts. We gave Mr. Humphries the prize, and his was again the lowest priced machine. All rather exceeded 6-horse power, but Mr. Humphries's was a very perfect machine.—See Table II.

"Table II.—The simplest and most practically useful Portable Combined Threshing-Machines, not requiring more than Six-horse Power (Class 23).

Trial with 100 Sheaves of Wheat.

Name of Exhibitor.	Nominal Horse-power.	Real Horse-power.	Time in Minutes Threshing 100 Sheaves of Wheat.	Horse-power consumed if Threshed in 1 Minute.	Clean Threshed.	Clean Shaken.	Chafings free from Corn.	Chaff free from Corn.	Corn Unbroken.	Straw Unbroken.	Comparative Merit.	Price.
Perfect Work represented by . . .					15	15	12	12	15	15	84	
			Min.									£.
Humphries . .	6	7·738	8·16	63·142	15	14	12	12	15	15	83	83
Holmes and Son .	6	8·598	5·28	45·397	15	11	10	12	12	5	65	85
Oliver Maggs . .	6	7·232	5·36	38·763	15	9	..	..	14	13	51	90
Brown and May .	6	8·328	8·88	73·952	15	11	8	10	14	13	71	100
Webber, B. J. . .	6	This machine failed totally.										

Barley, 20 Sheaves.

Humphries . .	6	5·952	5·84	34·760	15	10	10	12	13	..	60	..
Holmes and Son .	6	6·52	4·528	29·522	15	5	5	12	8	..	45	..
Oliver Maggs . .	6	6·377	4·4	28·058	15	..	..	..	..	..	15	..
Brown and May .	6	7·623	6·24	47·567	15	..	..	12	10	..	37	..

Note.—The Barley-straw was so bad in itself, we could not possibly judge of the work; and the corn was very much grown.

"Class 24.*

"Portable Three-and-half Horse-Power Threshing Machines, with Riddle, &c.

"Next came the nominal 3½ horse-power machines. We must say that most of them were too weak for steam-power, and it seemed from their fittings they were all made to be worked by the old-fashioned horse-works; but they were too hard work for any four horses to get through any amount of work.

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* The prize offered in this class (24) *was* especially intended for horse-power threshing-machines, though the Judges seem to give us a hint that these are, or ought to be, out of date. Still, on small farms, where water-power cannot be had, this sort of threshing-machine may still be found useful, especially if the horse-gear is so arranged as to be applicable for chaff-cutting and corn-bruising, and for working the apple-mill.—J. E. K.

Mr. Brinsmead's worked admirably, and we gave it the prize. We cannot leave the threshing-machine class without expressing our opinion most strongly in favour of rotatory motion, especially as regards the 'Brinsmead Straw-shaker.' We highly commended Mr. Polyblank and commended Mr. Beare.

"We are sorry to add that we could not test any of this class with barley in any sort of fairness, owing to the excessively grown state of the corn; it seemed impossible for any machine to separate the corn and straw.—See Table III.

"TABLE III.—PORTABLE MACHINES of 3½-Horse Power, with Shakers and Riddle (Class 24).

Wheat.

Name of Exhibitor.	Nominal Horse-power.	Real Horse-power.	Time in Minutes Threshing 30 Sheaves of Wheat.	Horse-power consumed if Threshed in 1 Minute.	Clean Threshed.	Clean Shaken.	Chaffings free from Corn.	Chaff free from Corn.	Corn Unbroken.	Straw Unbroken.	Comparative Merit.	Price.
Perfect Work represented by . . .					15	15	12	12	15	15	84	
			Min.									£.
Brinsmead . . .	3½	4·176	2·56	10·690	15	15	none.	12	15	..	57	43
Webber, B. J. . .	3½	8·333	1·512	12·599	15	15	..	..	..	..	30	30
Bowhay	3½	4·464	2·88	12·856	..	..	..	..	..	..	..	50
Dicker	3½	4·166	3 24	14·978	..	..	..	..	..	..	..	30
Polyblank . . .	3½	4·762	3·24	15·428	15	15	12	..	..	..	42	30
Beare.	3½	3·571	3·36	11·998	Good work, but very slow.							37*
Burrows and Page .	3½	4·762	2·16	10·285	Very moderate machine.							45

* With horse-gear.

"CLASS 25.

"PORTABLE FOUR-HORSE GEAR.

"The tabular statement, so cleverly drawn up by Mr. Froude, must speak for the above, in which class we gave the prize to Mr. Webber, and commended Mr. Beare.—See Table IV."

As these trials of horse-gear were made by means of the appliances invented by Mr. Belfield, and now used for the first time, the explanation which he has at my request kindly furnished will be read with interest, and tend to explain the tabular statement of the results of the trials.

"TRIALS OF HORSE-GEAR.

"It can hardly have escaped the observation of those who have examined the Implement Prize Sheets for 1856 and 1857 that an important alteration has been made in relation to threshing-machines intended to be driven by horses, which, instead of being with their horse-works the subject of a single premium, as heretofore, are now subdivided and distinct prizes offered for the machine itself, and for the machinery through the medium of which the power of the horses is applied to work it. The necessity for such a division will be readily apparent when it is considered that one of the essentials of every machine is, that it should do its work with as little expenditure of power as possible, all which compete for a prize being specially tested as to their efficiency on this point; and also that one of the objects which the Council have in view in resorting to such tests, is not only to distinguish by the awards of their judges those implements which are most deserving of commendation, but at the same time to indicate (where practicable) the particular faults detected in others, as a guide and assistance to the manufacturers on future occasions. Now in the former and ordinary way of testing horse threshing-machines, by driving the whole of the machinery together and at one time, the amount of power consumed in the performance of a certain quantity of work could be readily arrived at. But there was no means of ascertaining how much of this power was consumed in the legitimate working of the machine itself, and how much was lost and absolutely thrown away by the friction of those parts which did no work themselves, but were only the means by which power was transmitted to the beaters; and hence it might, with great probability, happen that the best machine in the yard was condemned in consequence of the faulty working of the driving gear, and that the manufacturer, as well as the public, being left without a clue as to where the fault really lay, might be induced to expend his energies on that which did not need alteration, whilst the real defect remained unaltered and unabated. To meet this evil, then, distinct prizes were offered for the two portions of these threshing machines, which involved the necessity of each being tested and judged of on its own merits or demerits, and on these alone. And to do this efficiently and accurately necessitated the invention and construction of machinery specially applicable to the purpose; since, although the threshing-machine itself could be readily and at once tested by the means already in use for those which were intended to be driven by steam, and which only involved the necessity of measuring the total power consumed in the performance of a given quantity of work, in the case of the horse-gear it was requisite to ascertain not only the amount of force employed at the end of the arms, but also the quantity of available power given off by the driving-shaft, as the difference between these two is the amount lost by friction, which it should be the object of manufacturers to reduce to the lowest possible point. In order to attain to this result, the following was the plan adopted: To the arms of the horse-gear was attached an arrangement of steelyards, to which were fastened the ropes by which the machinery was set in motion during the trial, and from which lines were led to a spring-balance which indicated the aggregate amount of force exerted at the ends of the several arms. The driving-shaft of each horse-gear in succession was next connected with a small brake-wheel, on the circumference of which was a belt, to which were suspended weights, and which was arranged in such a manner as to cause the brake-wheel, as it revolved, to raise and keep in suspension one of these weights, which thus became the measure of the friction on the wheel, and consequently of the power required to turn it. The machinery being then set in motion by pulling on the ropes, the brake-wheel is made by it to revolve under the fixed pressure above alluded to, whilst the spring-balance indicates the actual power employed in causing it to do so; and these two weights or powers being severally multiplied as follows, viz. the power at the ends of the arms as indicated by the balance into the length of one of the arms, and the fixed weight on the brake-wheel into half of its diameter, and again by the number of its revolutions for one of the horse-wheel, the difference between the two sums thus obtained is the loss by friction in each case, and gives the result sought for. It will be seen by the following Table of results that the weight used in each trial was the same, viz. 49 lbs., and the diameter of the brake-wheel was 12 inches. The other measurements will be seen under their different heads:—

" Table IV. (Class 25).

Maker and Reference.	Stand.	Article.	Force applied to Horse-arms.	Diameter for application of Force.		Circumference for application of Force (1 revolution).	Units of Power supplied for application of Force, or Force × Circumference.	Effective load on Brake-pulley 1 foot in diameter.	Revolutions of Brake to 1 revolution of Horse-arms.	Travel of Brake for 1 revolution of Horse-arms.	Units of Work done for 1 revolution of Horse-arms, or load lifted × travel of Brake.	Ratio of Work to Power.	Lost in Friction.
				ft.	in.			lbs.					
ambridge . .	..	..	102	20	10	65·5	6,690	49	33	103·5	5,075	·761	·239
urrows & Page	..	..	132	16	11	53·2	7,000	49	36·5	114·5	5,605	·801	·199
liver Maggs .	15	5	108	18	9¼	58·8	6,370	49	32·25	101·2	4,960	·779	·221
eer	20	1	85·5	17	3	54·1	4,630	49	24·75	77·9	3,815	·821	·179
ebber . . .	52	..	99	18	8½	56	5,550	49	30·25	102	4,980	·895	·105
olyblank . .	57	1	123	16	9¼	52·5	5,910	49	29·5	92·5	4,530	·765	·235
. & W. Dicker .	65	1	246	16	8	52·0	12,590	49	70	220	10,800	·860	·140
oods . . .	90	12	166·5	19	1	59·5	9,850	49	50	157	7,620	·772	·228

" Class 29.

" Winnowing Machines.

" The winnowing-machines were very numerous, but those which appeared at first sight to be the best constructed, failed to do their work as well as some of less price. We gave the prize to Mr. Eaton, and commended the machines of Messrs. Boby and Messrs. Burrows and Page.

" Class 33.

" Chaff-cutters for Steam or Horse Power.

" The chaff-cutters worked by steam next appeared, but Cornes, of Barbridge, maintained his high fame, as he also did with his hand-power machine. We do not at all approve of Mr. Carson's knives for steam-power, and cannot recommend them ; though we highly commended the machine for the quantity and quality of chaff cut by it, as also that of Messrs. Smith and Ashby, which is a really good farmer's implement. Mr. Carson's hand-power machine we commended, and of this class of hand-machines, all would do good work for any farmer who may be tempted to purchase one of them.

" Table V.—Chaff-cutters worked by Steam.

Name of Exhibitor.	Stand.	Article.	Lbs. of Chaff cut.	Units of Power.	Time.	Units of Power to cut 1 lb. of Chaff equal lbs. lifted 1 foot high.	Lbs. of Chaff cut per Hour.	Price.		Observations.
					Min.			£.	s.	
Carson	7	12	54	145,672	2	2679	1620	14	0	Highly commended ; no reverse motion.
Cornes	13	1	44	123,906	2	2816	1320	13	0	Prize; reverses motion.
Maggs	15	6	41	125,714	2	3066	1230	15	0	Reverses motion.
Smith & Ashby .	37	6	40½	94,285	2	2357	1215	13	10	Ditto.
Richmond & Co. .	66	2	41½	79,200	2	1931	1245	7	0	No reverse motion.
Fisher	79	4	..	74,642	2	..	..	..		

Note.—The two last machines cut very rough chaff, owing to their only being fitted with two knives, and the very unequal feeding of the rollers.

"CLASS 37.

"CORN AND PULSE BRUISERS FOR STEAM POWER.

"We had two competitors; Mr. Turner (Ipswich), and Mr. Wood (Stowmarket). We gave Mr. Turner the prize. The Tables will show the power required, in units.—See Table VI.

"TABLE VI.—CORN AND PULSE BRUISERS FOR STEAM-POWER.

Name.	Stand.	Article.	Time crushing 1 bushel of Barley.	Units of Power used.	Quantity crushed per Hour.	Time crushing ¼ peck of Linseed.	Units of Power used.	Quantity bruised per Hour.	Price.	Observations.
			Min.		Bush.			Bush.	£. s.	
Turner.	40	1	6	122,571	10	0·28	12,068	8	11 11	Excellent work.
Wood .	90	2	5	589,275	12	0·28	28,285	8	11 11	Requires too much power.

"CLASS 38.

"CORN AND PULSE CRUSHERS FOR HAND POWER.

"Mr. Wood's, of Stowmarket, was superior to all others tried (Mr. Turner did not enter one), and we gave him the prize for a very good machine, which did excellent work.* The others were kibblers, not bruisers, and we suppose all farmers are well aware that if flour is made in the attempt to bruise there is much waste; therefore we say, Grind or bruise, but let us have no half measures. We allow that kibbling is a good substitute for grinding on small farms, where the kibbled corn is at once mixed with other food for stock or pigs.†

"The root-pulpers, which ought to be called 'Mincers,' put in an appearance as usual, but failed to pulp, although making very good work for the purpose required. Mr. Bentall was awarded the prize. In case of breakage the saw teeth for this machine are very cheap and easily put in.

"We had but three turnip-cutters, and the work was done best by Mr. Carson, to whom we gave the prize. That of Mr. Pearse in two trials failed to feed without great trouble, and the knives are expensive.

"The oilcake-breakers were for hand-power, and all we tried did fair work; that of Messrs. Smith and Ashby gained the prize, and we highly commended Mr. Fisher's. Both these machines break for sheep and bullocks, and there is no trouble or time lost in adjusting them.

"We found in Mr. Turner's (Ipswich) stand a combined crushing and grinding mill. Price 28*l*. The stones were French burrs, 18 inches diameter; we tested this machine with steam-power, and found that with 3¼ horse-power it would grind wheat and barley into very good meal at the rate of seven bushels per hour.* This was done, although the machine had not been worked before and was not entered for trial. The stones are fixed on an iron table and the crusher above them, so the corn is broken before entering the stones. No corn could be ground better for farm purposes. We considered it so superior to all others yet brought before the public, both as regards price and the quantity and quality of work done, that, with the consent of our steward, we awarded Mr. Turner a special prize, and venture to call the attention of agriculturists to its merits. The crusher can be used separately.

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* From a correspondence which subsequently took place it seems that Mr. Turner was under the impression that a hand-power bruiser had been entered by his man. But as no such entry was on the Judges' books they were unable to try it, though, from their remark upon Mr. Turner's non-entry, they seem to wish to guard themselves from passing any discredit on so good an implement.—J. E. K.

† In these remarks on bruising and "kibbling," all who have had experience in the work will, I think, agree; but the Council, in settling the terms of these prizes, purposely used the word "crusher" in the *hand* machine, fearing that no "*bruiser*," strictly so called, could be made to do sufficient work with hand-power. If Mr. Wood or Mr. Turner have accomplished this, they have achieved a great success; but another year it will be satisfactory to know the relative quantity of work done under the two systems.—J. E. K.

"We cannot conclude our Report without congratulating the Society on the excellent show of implements, also on the great exertions of machine-makers in the Western districts to supply the wants of their agricultural neighbours, and their success in those endeavours. We also beg to thank most kindly the whole staff of the Society for the great attention and kindness we received from them, being quite sure we never can forget the hospitalities of the Newton Meeting.

(Signed) "H. B. CALDWELL.
"T. H. BARKER."

REPORT OF MISCELLANEOUS JUDGES.

"This department of the exhibition afforded the most satisfactory proof of the steady progress the Society is making in developing the art not only of *local* exhibitors, but of manufacturers *generally*. This is shown not alone by the vast increase of numbers, but likewise by the improved quality and workmanship of the different articles; indeed if fault could be found it must be placed on the side of excess, rather than of deficiency, of labour and art in their construction: bright rods and polished cranks may afford occupation for idle hands, but what agriculturists really require are substantial well-made implements devoid of all the ornament and tinted colours now so frequently exhibited in our show-yards, and which, when purchased, only entail labour and cost in keeping in order. Competition was very keen and spirited throughout the classes, and your Judges report with pleasure on the good temper and feeling evinced by losing 'candidates for honour.' The time seems to have arrived when all acknowledge that there are certain rules and principles which judges follow, that cannot fail to give true and certain results. The anxiety also shown to gather information from the observations of your judges, and exhibitors' readiness to act upon their suggestion, prove also the great value of these annual trials. Many instances could be shown of success on this occasion having followed from improvements suggested by the judges last year.

"As the details of all the trials would occupy more space than can be allowed in this Report (of the judges generally), we trust those that are not mentioned will not consider their inventions were overlooked or labours unappreciated.

"CLASS 30.—*One-Horse Carts.*

"Throughout this class great excellency was observable; straight wheels, plank sides, and the abandonment of tenons and mortices are now the acknowledged points of excellence in all agricultural carriages. To this we may add still higher wheels and greater length of shafts. In Paris, with inferior horses to those employed in this country, loads of 3 and 4 tons may be seen drawn by single horses. Messrs. T. Milford had availed themselves of this new light, which, added to the general merits of their whole cart, entitled them to the prize. Since this meeting they have been again successful at

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* The dynamometer unfortunately was not available in this trial, having been taken to pieces at the close of the other trials, under the impression that all were concluded; the driving-power consequently could only be estimated from the steam employed.

Salisbury, although they there appeared to push a good principle a little beyond moderation, having increased their wheels in height to about 6 feet, which occasions inconvenience in loading.

"CLASS 31.

"Although closely pursued by their brother, Mr. G. Milford, who exhibited a very strong and useful waggon for which he was commended, they obtained in this class also the prize.

"CLASS 32.—*Rick Covers.*

"At length one has appeared. The variableness of the Western climate and the many thousand acres of grass annually converted into hay furnish matter for surprise that they are so seldom seen in the West. Rick covers and poles are everywhere used in Herts, Essex, and Middlesex, and prove the means of saving hundreds of tons of hay. The Society has indeed not only laboured to introduce them by offering a prize, but has further held out inducement by allowing the steward of shedding to sell at prime (wholesale) cost the excellent covers belonging to them, and which may be obtained fit for use unbleached at 10*d.* or 11*d.* the yard. Mr. Taylor's plan of staging his poles is simple and inexpensive. We often see cloths thrown on haystacks; this is injurious, not alone from the speedy destruction of the fabric of the cloth, but more particularly from keeping down the steam of the new hay and exciting violent fermentation.

"CLASS 41.—*The best and most economical Steaming-Apparatus.*

"Our space will not admit comparison of the relative advantages of steamed over pulped roots; let it suffice that for those who prefer the former method of preparing food they may meet with all they require both in Richmond and Chandler, and Brown and Son; 'for simplicity and economy' we preferred the former; at the same time we cannot speak too highly of the skill and care bestowed on the construction of the latter, and where much work has to be done and cost is not an object the latter will be found valuable. The use of tubular boilers on so small a scale is to us a novelty and to be recommended with caution: we gave a Commendation to it.

"CLASS 42.—*Churns.*

"One on an entirely new principle was entered for competition and worked by the Rev. E. Ferryman. It is triangular in form, and set in motion by a lever-handle, which gives to the spatula or beater a lateral motion, forcing the cream from side to side through its apertures. After the butter is made it kneads or presses out the buttermilk so thoroughly that the hand is never required to touch the butter. The results were as follows:—Each churn was allowed 3¼ lbs. of scalded cream; Mr. Ferryman 2 lbs. 2 oz. of butter produced in 6¼ min., salted, kneaded, and fit for table in 17 min. Dray and Co. 1¼ lbs. in 35 min.; the dairywoman, however, allowed a portion of the cream to escape with her buttermilk.

"CLASS 43.—*Cheese-Presses.*

"We awarded the prize in this class to Messrs. Carson and Son for a *very admirably* made and well constructed press, occupying less space than any of its rivals. If instances were required to be multiplied of the importance of continuous trials, we think this award furnishes another. Messrs. Carson and Son were unsuccessful, as we gather from past reports, from deficiency of power. On this occasion they exhibited their press with the evil remedied (by the addition of a 15 lb. weight, which acts on the screw through the medium of a compound lever), and obtained the prize.

"CLASS 44.—*Apple-Mill.*

"We fully concur in the remarks made last year by the Judges on this mill; it appeared again without a rival, and received the prize.

"CLASS 45.—*Cider-Press.*

"Mr. Eddy exhibited one manufactured, and indeed invented, by Messrs. Mackin and Parkin of Exeter; its chief novelty consisted of a new ratchet-motion given to the lever, the object being to obtain increased power, and to save time in lowering. The makers had not perfected the press, being hurried to get it ready for the Exhibition; and although we commended the ratchet-motion, we could not award to it the prize in its present form.

"CLASS 46.—*Cooking Apparatus for Farm Kitchens.*

"This class occasioned us no little labour or difficulty from the number exhibited, and from the *points of peculiar* excellency prevailing in all. We do not doubt that our decision under this head may be open to praise or censure as individuals view the advantages and disadvantages of the open or closed range; our own experience and practice induce us to believe that the open fire-place is the better principle to recommend for farmhouse purposes. Taking general construction, size of oven and boiler, with *weight* and *price*, Mr. Glyddon's range seemed to us the most deserving, and was awarded the prize. The use, however, of a fire-brick back, unless made stronger, is not to be encouraged.

"CLASS 47.—*Field-Gates.*

"If iron field-gates are ever to divide the honour with 'hearts of oak' they must be produced at a much less cost. Messrs. Wightman and Denning, and Hill and Smith, showed some useful gates made of tubular iron; but when set against a well-made oak gate, costing from 13*s.* to 15*s.* (or about half the cost of the iron), they did not seem to us sufficiently economical to entitle them to the Society's prize.

"CLASS 48.—*Fencing.*

"Messrs. Hill and Smith had no real competitor of importance, worth, or value, and we had no hesitation in assigning them the prize for their wire-fencing.

"Certificates of merit were awarded to Mr. Boby for his patent corn-screen; to Mr. Biggs for his sheep-dipping apparatus; to Mr. James for his cattle-weighing machine; to Mr. Stark for his stand, exhibiting as it did the largest and *best selection* of articles in arts and manufactures yet shown; to Mr. Pearse for his patent endless-band saw, invented and manufactured by Barrett, Exall, and Andrews; to Mr. Wescott for his *humane* bee-hive; to Messrs. Smith and England for their patent laminated spades and shovels; to Thomas and Co. for improvement in hollow bricks; and to Mr. James for a liquid-manure cart.

"Special awards were also made of 1*l.* to Mr. Sawney for improved weighing-machine and sack-lifter; and of 10*s.* to Messrs. Whitmee and Co. for a domestic flour-mill with dresser.

"SAMUEL PITMAN.
"J. DRUCE."

From these several Reports the Society at large and exhibitors generally will, it is hoped, gain much useful information, while they cannot fail to be sensible of the great obligation *all parties* are under to these gentlemen who have so liberally devoted so much time and careful consideration in making their awards, and who in the most disinterested way thus placed their services at the disposal of the Society. It is no slight work which the Judges have to perform, and no small inconvenience to leave large farms for a week together at the season of swede-sowing and one of the busiest times of the year. Feeling this, it will also be a great satisfaction to the Members of the Society to read in the Reports so kindly furnished by these gentlemen, that they have been pleased with the arrangements made for their reception at Newton, and that they have left with a favourable impression of the Exhibitors and of the proceedings of the Bath and West of England Society.

But though this paper has special reference to the implements which were submitted to the test and scrutiny of the gentlemen who kindly officiated as Judges, it would be very incomplete if no mention were made of the successful exhibition of steam-ploughing which, thanks to Mr. Fowler, was afforded us in this West country. It was no part of the business of the Newton meeting to pronounce an opinion on the economical application of steam-power to field cultivation, or on the comparative merit of those appliances for this purpose, to which public attention is now so much directed. At the same time it is only due to Mr. Fowler to state, that the record of public opinion, even in a district where steam-ploughing was thought almost an impossibility, was decidedly in his favour; and that while, in points of detail, alterations tending to economy seemed requisite, yet the principle was sound, and that steam cultivation was thus not only proved to be possible, but, ere long, likely, in suitable districts, to be of general application.

II.—*Report on Live Stock at Newton.* By Professor Brown, of the Royal Agricultural College, Cirencester.

The late exhibition at Newton must have been as gratifying to the friends and supporters of the Bath and West of England Agricultural Society, as it was creditable to the county in which it was held. Taking the stock on the whole there was little to be desired, and in particularizing excellences we should not wish to be understood as condemning even by omission; where so much was deserving of praise the observer might fairly become fastidious, and pass over without notice animals which under other circumstances might have produced a most favourable impression.

Horses.—The horses as a class exceeded what we have usually found at agricultural exhibitions. In general it is admitted to be the case that good animals are not sent: whether the advantages offered to exhibitors are not sufficient to induce them to select their best stock; or the subject not considered sufficiently important to merit special attention, we need not inquire; suffice it to say that the people of Devonshire have seen reason enough to bring forward animals that would not disgrace any of our best horse-breeding counties. Among the brood mares for Agricultural purposes, we noticed a chestnut Suffolk, exhibited by G. D. Badham, Esq., of Ipswich; a roan, by E. Holland, Esq., and a black mare, by the Rev. J. G. Copleston, of Honiton; all animals of the "right stamp." Among the mares for riding purposes, Mr. Trood's bay mare, and another belonging to Mr. Coaker, of Marldon, presented points which every judge at once recognizes and appreciates, but which are unfortunately too little insisted upon in our better breeds of horses—a proof of want of care rather than want of knowledge in our breeders. May we here in passing express a hope, that the time is coming when it will be generally admitted that an animal may be too young or too old for breeding? too young when its own growth is not yet perfect, and too old when, at the close of a long and laborious service, halt and blind, it is candidly allowed by the owner that the "old mare" is fit for nothing but to breed from.

The yearlings and two-year-olds were satisfactory as far as the number went, but we hope another time to see even a larger number of competitors, particularly in the yearling class. Anything which encourages a better system of feeding young stock of all kinds, we hold to be an important step in the right direction. Setting aside every other consideration, there is no economy in arresting the growth of young animals by an insufficient supply of food. The cart colt sent by Mr. Watson of Dorsley, another by Mr. Isaac Humphry of East Lambrook, South Petherton, and a yearling by Mr. Bailey of Berkeley, were good specimens. Mr. Elliott's three-year-old bay colt was a magnificent animal, such a one as we do not often see except on canvas, recalling a time when high blood was not necessarily connected with light carcase and long legs, great speed and no endurance.

Cattle.—The exhibition being holden in the county of Devon, we anticipated a good show of native cattle: nor were our expectations disappointed. Among a large number of entries we could scarcely find anything to censure. The Devonshire farmer, having the advantage of a good breed to commence with, only requires to exercise care in selecting his breeding stock in order to insure satisfactory results. Of general excellences in the animals exhibited at Newton the points that particularly struck us were, great development of the hind quarters, breadth of loin, and absence of any angular projection either of hip-bones or spine; the fact of the prime portions of the meat being found near these parts will explain why so much importance is attached to their good conformation. Taking into account the influence of respiration in the consumption of fatty elements, we may excuse a certain lessening of the size of the chest, and consequently of the lungs and circulating organs: provided that there is no actual constriction of the cavity, we gain by a diminution of the activity of the respiratory functions—always assuming that the lungs and heart have ample room for action. We were glad, therefore, to observe in the Devon cattle depth as well as width of chest joined with other evidences of careful cultivation, such as fine and thin skin, soft hair, fineness of bone, shortness of extremities, fine-grained horn, small head, and, what we estimate very highly, a bright, well-formed, and good-tempered-looking eye. These points seemed to be equally common to the large and small breeds, as well as the cross which combines the qualities of both. The young animals were in excellent condition and in a forward state of development; and while we mentally gave all credit to the breeder for the judgment that had enabled him by judicious selections to produce such precocity, we could not help regretting that it should be abused so commonly in the prevailing system of early breeding, although we are fully alive to the practical difficulties in the way of any alteration of such system. Physiology would justify us in waiting until the animal had acquired its full growth, or at least until it had completed its dentition, before it should be permitted to breed; but unhappily the loss to the farmer which such delay would occasion furnishes a ready, if not a conclusive, answer to the arguments advanced by science.

Where so much could be conscientiously commended it seems almost unnecessary to select instances. Nevertheless, among the number we singled out a three-year-old bull, of Mr. Davy of Northmolton; another, of Mr. Bodley of Crediton: of bulls under three years, one belonging to Mr. Anstey of Tiverton; another, of Mr. G. Turner of Barton. Among the cows and heifers those exhibited by Mr. Corner of Taunton, and Mr. Walter Farthing of Bridgewater, were deserving of special notice for the possession of the good qualities we have mentioned.

The short-horn breed were by no means in the background, as indeed they could scarcely be, where Mr. Stratton's animals are present; this celebrated breeder, in reference to whom comment would be superfluous, carried off deservedly, as every one will admit, most of the prizes for the classes under which he exhibited.

Exclusive of Mr. Stratton's stock, fine specimens by other exhibitors were not wanting, as instanced in the three-year-old bull sent by Mr. Miles of Langford, Bristol, one by Mr. Pilgrim of Abbotskerswell, and also one by Mr. Fowle of Devizes; and among cows by animals belonging to Mr. Smith of Bibury, and Mr. Pollard of Blagdon, Devon.

In the class admitting other breeds, the Herefords took first rank—good specimens of the breed being exhibited by Mr. W. Carey Coles of Yeovil, Mr. T. Beale Brown of Hampen, and Mr. John Feaver of West Camel, Ilchester.

Pigs.—The entries in this class were not numerous; nor were the animals exhibited remarkable for any particular excellences. The small breeds certainly had the advantage, especially the boars under 2 years, which as a class were the best in the exhibition. Some good specimens of Berkshire were sent by Mr. Hewer of Highworth, and the Rev. H. G. Baily, Swindon, and some fair animals of the Essex breed by Mr. G. Turner of Barton.

Sheep.—The competition in this class was undoubtedly spirited, the number of animals considerable, and the selections good.

The Leicesters preponderated, at least in number, and we have a right to conclude that the best points of the breed were illustrated. We could not, however, avoid noticing disproportionate length of legs, sometimes accompanied by falling off in the hind quarters, and a general narrowing immediately behind the shoulder, indicative of a too decided diminution of the cavity of the chest; one principal cause, we believe, of that constitutional weakness that separates in some degree all cultivated breeds from native ones. Among the best yearling rams we place one of those sent by Mr. G. Radmore of Court Hayes; one by Mr. G. Turner of Barton, Exeter; another by Mr. Buller of Downes; and another by Mr. Bodley. Among the ewes the pens of Mr. Buller, Mr. John Partridge, and Mr. Salter, included some fine animals.

The Cotswold breed had its reputation well sustained by the specimens forwarded by Mr. Handy of Cheltenham, Mr. Tombs of Langford, and Mr. T. Beale Browne of Hampen. The animals, although not by any means free from the consequences of artificial breeding, avoided many of the defects of the Leicesters.

The Down sheep were neither very numerous nor very remarkable for quality; some good animals were exhibited by Mr. John Moore of Pewsey; Mr. Lucas of East Coker; Mr. Harbin of Newton House, Yeovil; and Mr. Olding of Amesbury.

The horned sheep, Somerset and Dorset, were few but good; the rams showing the peculiarity well known to practical men, of bad fore-quarters, while the ewes are usually good in this point; the defective development in the male being explained by the great growth of horn causing a diversion of the nutritive function —an idea quite warranted by the laws of physiology, and at once suggesting the remedy.

The mountain sheep were also small in number, but decidedly fine little animals, with an exuberance of vitality that we should look in vain to find in the other classes; their small size may tend to prevent the extension of the breed, but how far this might be improved by a careful selection and good food, without crossing, is a question quite worth deciding by experiment.

The Newton exhibition confirmed the writer in conclusions already drawn from a great number of observations on the constitution and internal organs of highly-bred sheep. Connected as these animals are with the very existence of turnip husbandry, we cannot wonder at the attention given to high breeding; but the results of this attention are not all satisfactory. If we compare the present cultivated breeds with the original hardy mountain sheep, it requires no argument to prove that domestication has impaired their original strength of constitution and their power of resisting causes of disease. In fact, the tendency to consumption among highly-bred sheep is very general. In the most healthy condition of their system, the state of lung known as tuberculous is almost invariable, as the specimens obtainable from any butcher's establishment will show—an absolutely healthy organ being exceedingly rare, excepting in the lamb a few months old. This general taint, in itself expressive of weakness, removes all difficulty in explaining the extreme susceptibility to atmospheric influence; the occurrence of coughs with nasal discharge immediately on the prevalence of an east wind or rain; the difficult breathing so marked in a hot atmosphere, even although the animals are perfectly quiet; as well as the singular rapidity with which the system at once yields to the attacks of disease, allowing little or no time for the action of remedies, and giving rise to the universally admitted axiom, to the effect that the best surgeon for sheep diseases is the butcher.

This remarkable debility of the general system among sheep would, before this, have excited serious attention, were it not that so large a number are killed as fully grown animals at the age of one year, before the constitutional tendency has had time to exhibit itself in the occurrence of obvious disease; and further, it must be recollected that of the number attacked by any malady the greater part are consigned to the butcher at once, thereby preventing any great loss to the farmer.

The breeder, in pursuing his experiments in crossing, should bear in remembrance that small bone and aptitude to fatten are not always the legitimate limits of his art. Whatever is rapid in development wants the solidity and persistency that are the fruits of slower growth; it is certainly unfair to expect that the tissues which by artificial treatment have been driven to their completion in one fourth of the original time, should likewise possess the resistent power of structures gradually elaborated in the animal body in a perfectly natural state of existence.

At present, when we have succeeded to completeness in producing this thoroughly artificial condition, fine bone, small respiratory organs, with general precocity, we still require the animals to endure all sorts of weather in the open country; their principal value depending on the use made of them in feeding off turnip land; add to this the circumstance of their principal food being about four-fifths water, and we think the case is tolerably clear. How far these considerations may affect our sheep-breeders—what will be the results of a continuance of the present system—are matters not left to conjecture; physiology has determined that beyond a certain point artificial excellence shall not reach, while from that point commences degeneration. The remedy, fortunately, is not remote; our mountain breeds will afford new materials for invigorating the organism weakened by a too exclusive system of cultivating certain recognised excellences, without regard to the conditions under which the animal is required to exist. How and when the remedy shall be applied, whether in obedience to the dictates of prudence as soon as its propriety is indicated, or neglected until circumstances make it imperative, we leave to practical men to determine.*

III.—*Roofing of Farm-Buildings.* By S. W. P. ISAAC, Architect, Bath.

PRIZE ESSAY.

BEFORE entering upon the subject of this essay, we wish to refer to a paper by Mr. Belfield, in the Bath and West of England Agricultural Society's Journal for 1856, on Agricultural Architecture. This gentleman asserts that architects do not interest themselves in the requirements of the agriculturist, and are therefore entirely unacquainted with his wants. He recommends farmers to study architecture for themselves, and thus dispense with the services of professional men. There is no doubt that Mr. Belfield is well qualified to speak on this subject, but it is equally certain that the farmer is not generally so. We doubt whether the majority of agriculturists would have the time to qualify themselves so as to conduct building operations without assistance.

Before treating our subject under the presented heads we will briefly advert to the rules that regulate the strength of timbers and the framing of roofs, for the strength of the roof depends less on the quantity of timber than on its arrangement.

To dispose our timbers most economically we must have a clear idea of the nature of the force they will be required to resist, and of the position in which they will best sustain the same. For instance, timber will sustain more than three times the weight in tension or compression that it will bear on the cross strain.

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* These are bold remarks; but they contain important truth, confirmed by the practice of the sheep-breeders of North Devon and West Somerset.—R. SMITH.

1st. The strength of similar beams to resist a given weight is in inverse proportion to the square of their lengths: thus, a beam of 12 feet long would support nearly three times the weight that one 20 feet long, of the same dimensions, would sustain :—

For, Let A = 1st beam, 12 feet long.
B = 2nd do. 20 feet long.
$A : B :: 20^2 : 12^2.$
400 : 144.
3 to 1 nearly.

2nd. The strength of beams of equal length and thickness, but of unequal depth, are to each other in proportion as the squares of their depths: thus, a beam 9 inches deep would sustain 2¼ times the weight one 6 inches deep would, supposing them to be of the same length and thickness :—

Let A = 1st beam, 9 inches deep.
B = 2nd do. 6 inches deep.
$A : B :: 9^2 : 6^2.$
81 : 36.
2¼ : 1 nearly.

3rd. The strength of beams of unequal scantling but of the same length is in direct proportion to the squares of their depth multiplied by their thickness: thus, a beam 9 × 3 would support 3½ times the weight that one 6 × 2 would sustain :—

Let A = 1st beam, 9 × 3.
B = 2nd do. 6 × 2.
$A : B :: (9^2 \times 3) : (6^2 \times 2).$
243 : 72.
3½ : 1.

This rule will show that the strength of timber depends more on the way in which it is disposed than on the actual amount employed: for instance, a beam 10″ × 3″ would support 1⅔ times as much as one 6 × 5, although they both contain the same cubical content :—

For, Let A = 1st beam, 10 × 3.
B = 2nd do. 6 × 5.
(2). Then $A : B :: (10^2 \times 3) : (6^2 \times 5).$
300 : 180.
1⅔ : 1.

From what has been said, it is evident that the length, depth, and breadth, all enter into the calculation of the comparative strength of timbers.

Hence, 4th, the comparative weights which two beams of unequal scantlings and lengths will sustain are in direct proportion as the square of the depth multiplied by their thickness, and divided by the square of their length :—

Let A = 1st beam's comparative strength.
D its depth.
T its thickness.
L its length.

Let B = 2nd beam's comparative strength.
d its depth.
t its thickness.
l its length.

then—

$$A : B :: \frac{D^2 \times T}{L^2} :: \frac{d^2 \times t}{l}.$$

Supposing the weight that A will sustain is known, it is clear we can easily ascertain by this formula the weight that B will support: for instance, if A 9″ × 3″ and 12 feet long will sustain 200 lbs., what weight will B 6″ × 3″ and 10 feet long support?

$$\frac{D^2 \times T}{L^2} :: \frac{d^2 \times t}{l} :: 200.$$

$$\frac{9^2 \times 3}{12^2} :: \frac{6^2 \times 3}{10^2} :: 200.$$

$$\frac{243}{144} :: \frac{108}{100} :: 200 : 123.$$

Now, the strengths of most woods commonly in use have been tested, and a *constant* answering to A (which has been taken as 1 foot long and 1 inch square) fixed for each. Consequently, to ascertain the weight that any timber will support, we have but to multiply the square of the depth by the thickness, and this again by the constant, and divide by the square of the length. Let W = weight, then $\frac{D^2 T C}{L^2} = W$.

The following Table shows the experimental strength of various species of timber opposed to a transverse or cross strain. In the sixth column is given the constants or the breaking weight in lbs. which a bar 1 inch square and 1 foot long will sustain:—

Kinds of Wood.	Specific gravity.	Length in feet.	Breadth in inches.	Depth in inches.	Breaking Weight.	Authorities.
Oak, English young tree ..	·863	1	1	1	1928	Tredgold.
„ from old tree	·625	1	1	1	872	„
„ medium quality ..	·748	1	1	1	1775	Ebbels.
Beech, do. do.	·690	1	1	1	1693	„
Ash, from young tree ..	·811	1	1	1	2025	Tredgold.
„ medium quality ..	·690	1	1	1	1587	Ebbles.
Ash	·753	1	1	1	1962	Tredgold.
Elm, common	·544	1	1	1	1350	Ebbels.
Riga fir	·480	1	1	1	1325	Tredgold.
Memel fir	·553	1	1	1	1362	„
Red pine	·657	1	1	1	3129	Barlow.
Iron, cast	6·912	1	1	1	6804	Banks.
„ wrought	6·912	1	1	1	8739	Tredgold.

The use of this table will be seen from the following example.

Required the weight an oak beam 6 in. × 9 in. and 12 feet long will support?

$$\frac{D^2 T C}{L^2} = W = \frac{9^2 \times 6 \times 1775}{12^2} = \frac{486 \times 1775}{144} = 5990 \text{ lbs.}$$

In like manner the strength of any other beam can be ascertained. From the foregoing formula the length, breadth, and thickness of a beam requisite to support a given weight can be ascertained. Thus:—

$$\text{To find length .. } L = \sqrt{\frac{D^2 T C}{W}}.$$

$$\text{,, depth .. } D = \sqrt{\frac{W L^2}{T C}}.$$

$$\text{,, thickness } T = \sqrt{\frac{W L^2}{D^2 C}}.$$

It may not be out of place here to note the different varieties of timber best adapted for the roofing of farm-buildings.

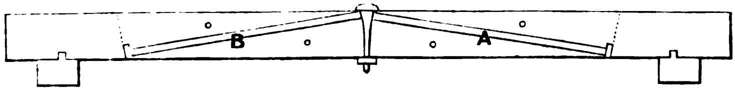
The fir timber imported into this country, and known as Memel and American red pine, is the best adapted for this purpose. Memel is admirably fitted for all outside work, as it is composed of strong and durable fibre bedded in resinous matter. It sells from 1*s.* 9*d.* to 2*s.* 3*d.* the cubic foot. The American red pine is clean, reedy, and resinous. It is seldom of so large dimensions as Memel, although frequently much longer. It is well suited for beams and joists. It fetches from 1*s.* 8*d.* to 2*s.* 3*d.* the cubic foot.

Home timber is also much used for farm-buildings. Elm forms excellent beams, but is liable to warp. For rafters it does not seem adapted. Its present value is about 9*d.* per cubic foot.

Other varieties of timber peculiar to the districts may often be used with advantage, such as varieties of the fir, larch, &c.

The different modes of constructing the timber frames of roofs.—The simplest form of roof would be the junction of two poles or pieces of timber in an inclined position. These timbers are variously known as rafters, couples, and principals. Now, unless these timbers were tied at their feet, the effect of pressure would be to spread them outwards. Such, in fact, happens in cases where, to avoid expense, roofs have been thus constructed. To overcome this, a tie-piece, variously known as a binding-joist or tie-beam, is introduced. But where the length of the principal is great it is necessary to introduce some other trusses to support the weight of the roofing. This in some cases is done by the introduction in the middle of a collar-beam. This kind of roof is termed a collar-beam roof. The pressure is otherwise met by the introduction of timbers, technically termed king-post and strutts. The king-post is the centre-piece on which the principals rest; the strutts are the pieces which bring the weight of the principal to the foot of the king-post. It will be seen that the weight on one side is counterbalanced by that on the other, both being conveyed to the king-post as a centre by means of the strutts. Now, in some cases this principle is lost sight of, and the strutts framed to the tie-beam instead of the king-post. The effect of this is to cause the tie-beam to fail. The tie-beam has from its own weight a tendency to fail at this point, which is overcome by its being as it were strapped to the king-post. This is frequently effected by stirrup-irons. The tie-beam should be hung loosely in them, and not bolted or nailed, but brought up to a camber* by means of small wedges. There is generally a small settlement in roofs after formation, and the timbers will sometimes be wrenched out of shape if the tie-beam is not allowed to drop or sag a little; this can be effected by the removal of one of the wedges. To support the common rafters a horizontal timber bearing from principal to principal is introduced; this is called a purlin. The corresponding piece at the apex of the roof is termed the ridge, or sometimes a first-piece. The piece of timber between the wall and tie-beam on which the latter rests is termed a template; that on which the feet of the rafters rest a wall or pole plate. The laths for slates or tiles, which are nailed horizontally on the rafters, are termed battens. Sometimes where the roof is of great span it is necessary to strengthen the timbers by what is termed trussing. It consists in applying the principle of the arch, and will be best understood from Figs. 1, 2:—

Fig. 1.



It is impossible for the beam to fail as long as the trusses A and B remain, since in giving way it would lessen the length of these trusses, which would receive the pressure in a simple compressed direction, and consequently be able to oppose a greater opposition than the beam, which would receive the pressure on the cross strain. Nicholson on Carpentry (page 57) advises in reference to trusses that—

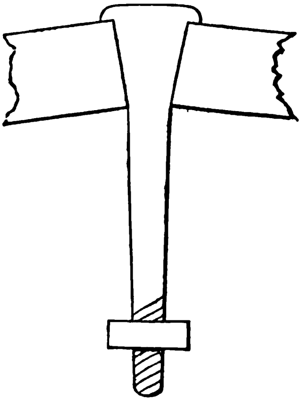
> "The cores of the trusses should not be let close into the grooves of the side-beams, but should be well secured at the ends and in the middle; for

---

* By camber is meant the slight bend given to timber, to compensate for settlement.

suppose a weight to be laid upon the girder sufficient to bend it: if the braces are tightly fitted they will bend along with the beams, and consequently be of no use; but if they are not fitted close, the girder can never have a curvature to any sensible degree, for the side-beams cannot bend without shortening their length, but in the act of bending the braces force upon the ends, and consequently act in opposition to the side-beam.

Fig. 2.



"In tightening the truss-work the head of the king-bolt ought to be greased, so that it may slide freely past the ends of the trusses; proceed to turn the nut of the king-bolt, and another person to hit the head at C with a mallet, which will make it start every time it is hit, and give fresh ease at every turning of the nut, so that the girder may be brought to any degree of camber that you shall have occasion for, but generally not above an inch in 20 feet."

Iron might perhaps be advantageously introduced for tie-beams and king-posts, the force borne by these pieces being that of tension instead of cross strain, for which a comparatively slight bar will answer as well as a stout timber; there would be, however, a difficulty in fitting in agricultural neighbourhoods. According to Barlow, a round bar of wrought iron ¾ inch diameter will sustain a tension of about 40,000 lbs., a weight greater than any tie-beam under any circumstances would be required to resist. The comparative economy of the substitution of iron for timber in tie-beam and king-post of roofs will be seen from the following estimate for a king-post roof, for a roof 20 feet span, 100 feet in length, and ⅓ pitch:—

1st. All timber:

	£.	*s.*	*d.*
270 cubic feet, in principals, key-posts, tie-beams, and strutts, at 3*s*..	40	10	0
Labour, framing same, and bolts and strap-irons, say ..	5	0	0
	£45	10	0

2nd. Part timber, part iron:

	£.	*s.*	*d.*
205 cubic feet, at 3*s*.	30	15	0
King-post and tie-beam of ¾ in. round, wrought iron, weight 4 cwt., at 9*s*.; labour to same, screws, nuts, &c., say	7	0	0
	£37	15	0

It has been suggested to me by Mr. George Parsons, of Martock, that iron might advantageously be applied to form the entire framework of the roofs of farm-buildings. The roofs of his engine and machine houses which he has recently erected on his own freehold are formed of iron, and are most simple and complete in their details. One shed, 33 feet wide and 150 feet long, is roofed as follows (Fig. 3):—The principals are of cast-iron, set 5 feet from centre to centre of the scantlings shown on section (Fig. 4). The tie-beams and king-post are of wrought-iron round bar ⅝ inch diameter. The strutts are of cast-iron, of the size shown on section (Fig. 5). The ridge-piece is of wrought-iron 2 in. × ⅜. The wall-plate into which the principals are dowelled is of elm 9 in. × 3 in., and distributes the pressure of the principals over the walls. The rafters are of ½ in. square cast-iron, laid horizontally or purlin-wise, and let into a dovetail groove, in the principal as shown in Fig. 5, and wedged up with a nail. The distance the rafters are set apart depends, of course, on the nature of the covering. If duchess slate be used, the distance would be (supposing the bond were 3 inches) 10½ inches; if double Roman tiles, 13 inches. The union of the several parts is effected by means of angle-irons and ⅝ bolts and nuts.

Fig. 3.

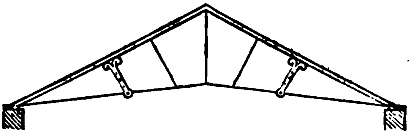


Fig. 4.

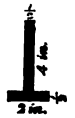
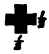


Fig. 5.

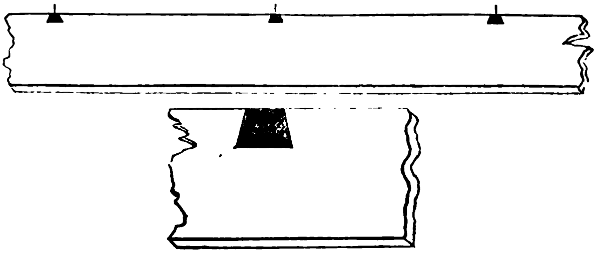


There can be no doubt if iron can be economically applied it will effect a great improvement in the roofing of farm-buildings. Farm-buildings formed in this way, and tiled or slated, would be nearly fireproof. Mr. Parsons' old farm-buildings, the roofs of which were of wood, were twice burnt down. This induced him to try iron. He states that few persons who have not experienced a similar misfortune can judge of the inconvenience and loss sustained during the erection of new buildings: no insurance can cover such loss.

It may be said that the damp would affect the metal, and eventually rust and destroy it: of this, however, there is no danger if the iron is painted with one coat of mineral paint. Whether it can be economically applied, however, is the question. To test this we subjoin a comparison of the cost of roofing a building 100 feet long and 20 feet wide (from out to out) with iron and timber. The pitch is supposed to be ⅓, and the cost of the framework alone is given, since the covering would be the same in each case. The saving in laths in one case is compensated by the extra trouble in fixing the tiles in the other:—

1st. The roof is proposed to be constructed of iron, as follows:—Principals of cast-iron 4 in. × ½ in., with a flange at bottom 2 in. × ½ in., as shown at Fig. 4, and 5 feet from centre to centre. King-post, tie-beam, and strutts, of round wrought-iron ¾ in. diameter, secured at their junction by angle-irons and ⅝ in. bolts and nuts. Ridge of wrought-iron 2 × ⅜. Rafters of wrought-iron ½ in. square, set 13½ inches from centre to centre for double Roman tile, the same to be secured to principal by a dovetail joint and small nail, as shown in Fig. 6. Wall-plate of elm 9 × 3. All the iron to be P. F. Welsh iron. The cost of a roof thus constructed would be somewhat as follows:—

Fig. 6.



	£.	s.	d.
19 pair of couples, each 12 ft. long, of cast-iron of section shown at page 35, fig. 4. Each pair of principals weighs 225 lbs., the whole 19 = 38 cwt.; 38 cwt. at 14*s.* per cwt. costs	26	12	0
38 feet of round wrought-iron, ¾ in. in diameter, for tie-beam, king-post, and strutts, to each pair of couples, 38 × 19 = 722 ft. for the 19 pair; each post in length weighs 1½ lbs. Total weight of the whole 1081 lbs., or 9½ cwt., at 9*s.* per cwt.	4	5	6
Ridge of wrought-iron, 2 × ⅜ 100 ft. long, weighs 2 cwt., at 9*s.* per cwt.	0	18	0
Rafters of wrought-iron, ½ in. square; 13½ in. from centre to centre, for double Roman tile, 20 both sides, making total of 2000 ft. for the whole; each post in length weighs 825 lbs. Total weight 15 cwt.; 15 cwt., at 9*s.*	6	15	0
Forming angle-irons to principals; fixing principals, including bolts, nuts, cutting dovetail notch for rafters, fixing same and all labour involved in fixing roof 24 square, at 4*s.* 6*d.*	5	8	0
200 ft. run of elm wall-plates, 9 × 3, containing 37 cubic feet at 1*s.* 6*d.*	2	15	6
	46	14	0
As the above is the cost-price of iron and labour, add 10 per cent. for builder's profit	4	12	9
	£51	6	9

The above calculation is based upon Tredgold's data, viz. that 1 cubic foot of cast and wrought iron weigh respectively 450 and 470 lbs.

We will now compare this with the cost of timber roofs, commencing with the *king-post roof.* The span, length, and pitch of the supposed building are the same as in the previous instance. The timbers are to be of Memel, of the following scantlings :—

Principals	9 × 3
King-post	9 × 3
Tie-beam	9 × 3
Ridge	6 × 1½
Strutts	4 × 3
Purlins	6 × 3
Wall-plate	7 × 3
Rafters	4 × 2

The principals to be 10 feet apart, and secured at their feet by ¾-in. wrought-iron bolts. The king-post to be secured at its feet by stirrup-irons 2 inches wide, ⅜ thick, and 2 feet long. The rafters to be set 14 inches from centre to centre. This roof contains :—

	£.	s.	d.
270 cubic feet of timber, at 3*s*.	40	10	0
Labour of framing the same, principals and rafters, bolts, &c., 24 square, at 7*s*.	8	8	0
	£48	18	0

(No. 2.) The roof known as the *collar-beam roof* is recommended for farm-buildings in Morton's 'Cyclopædia of Agriculture' (p. 805). The timbers are to be, as before, of Memel, of the following scantlings :—

Rafters	7 × 1¾
Collar-pieces, half checked on the rafters ..	4 × 2
Ties	6 × 1½
Ridge	6 × 1½
Wall-plate	7 × 3

The rafters are to be set 18 inches from centre to centre. The tie and collar beams to be secured by ⅜-in. wrought-iron bolts and nuts. This roof contains, supposing every rafter to be tied :—

	£.	s.	d.
290 cubic feet, at 3*s*.	43	10	0
Labour of framing the same, 24 square, at 6*s*.	7	4	0
	£50	14	0

(No. 3.) If only every other couple were framed, the cost would be as follows :—

	£.	s.	d.
230 cubic feet, at 3*s*.	34	10	0
Labour of framing the same, 24 square, at 5*s*.	6	0	0
	£40	10	0

The two following roofs are suggested by Sir Thomas Tancred, in the Royal Agricultural Society's Journal, 1850: No. 4 being a collar-beam roof, with a ¾-in. tie-rod of iron; No. 5 a roof with two diagonal ties.

(No. 4.) *The specification for No.* 4 would be as follows:—Principals to be set 11 feet from centre to centre; the same to be tied at the feet with round wrought P. F. Welsh iron tie-rod ¾ in. diameter:—

Tie-piece	5	×	4	
Purlins	6½	×	3½	
Ridge	7	×	1	
Wall-plate	6	×	3	
Common rafters ..	3½	×	2	to be set 14 in. from centre to centre.

The cost of roofing a shed of the same dimensions as before would be:—

	£.	s.	d.	
204 ft. of timber, at 3*s*.	30	12	0	
160 ft. of ¾ in. round, wrought iron, being 2¼ cwt. for tie-rod, at 9*s*. per cwt...	1	0	0	?
Labour in framing the same, 24 square, at 5*s*.	6	0	0	
	£37	12	0	

(No. 5.) *The specification for No.* 5 is as follows:—Rafters and diagonal braces 4 × 3, the same to be set 16 inches from centre to centre:—

Wall-plates	5	×	3
Ridge	7	×	1¼

The cost of this would be for a shed the same size as before:—

	£.	s.	d.
300 ft. of timber at 3*s*.	45	0	0
Labour in framing same, 24 square, at 5*s*.	6	0	0
	£51	0	0

(No. 6.) If only every other rafter were braced, it would be:—

	£.	s.	d.
250 ft. at 3*s*.	37	10	0
Labour in framing same, 24 square, at 5*s*.	6	0	0
	£43	10	0

It may, perhaps, be recollected by some of our readers that this description of roof was used for the cattle-sheds at the Bath and West of England Agricultural Show held at Taunton 1852. This kind of roof need not be framed with such heavy timbers as Sir Thomas Tancred proposes: for instance, the following dimensions might perhaps be found to answer:—

Rafters	4 × 2
Diagonal braces	4 × 2
Wall-plates	4 × 3
Ridge	7 × 1½

This would reduce the cost of timber by one-third.

From the above it appears that the cost of an iron * would exceed that of a timber roof by about one-seventh. It is a question if the greater durability of the iron may not in some degree compensate for the increased cost. On the other hand, the distance from an iron-foundry and the fluctuation in the price of iron may greatly modify these results.

It must be borne in mind that the timber used in farm-buildings is frequently the produce of the estate. The use of timber for this purpose is as advantageous to the proprietor as if he sold the same at the full market-price. It is, therefore, doubtful if iron will ever be extensively used in the roofing of "farm-buildings."

The effect and comparative economy of the various degrees of pitch or inclination.—The proper pitch for the roof depends on the nature of the covering used: thus the pitch for tiles must be more than that of slate, whilst the pitch of thatch must again exceed that of tiles. Something, too, depends on situation; for if slate be used, ¼ pitch will serve in an unexposed position, whilst in a more open one it would be well to increase the pitch a little, that is, the height of the ridge above the walls should be one-fourth, or a little more, of the outside breadth of the building. For tiles it would be safest to have the pitch as much as ⅓, whilst for thatch the pitch should never be less than ½.

It may be remarked, as a general rule, that hipped roofs are to be preferred to roofs with gables, since the former are less open to the wind. They are by some thought to be neater. The cost would be about the same as that of gables.

From this it will be seen that the pitch of the roof varies with the material used for the covering as follows:—

Thatch requires pitch of ..	½
Tile " ..	⅓
Slate " ..	¼

---

* Mr. Stephens speaks well of this kind of roof; he says, "it is well adapted for certain parts of a steading. On a dairy farm, a large byre, capable of containing all the cows of the farm under the view of the dairymaid at one time, might be so roofed in." . . . "A feeding-byre could be constructed on the same plan. The threshing-mill and straw barn might be contained under one such roof, affording abundance of room in its width to the water or steam-power, to the clearing of the corn in the barn, and to the straw chaff-cutter, and crushing-rollers in the straw barn. A roomy and airy granary could be formed under such a roof. Great accommodation would be afforded, by means of such a roof, to numbers of cattle all winter, and the sheep in the most stormy period of the winter on pastoral farms; and such an apartment would answer for dipping sheep in summer and bathing them in winter."—*Book of the Farm*, vol. ii. page 530.

Then supposing the building to be in each case 100 ft. × 20 ft., with a king-post roof, of which the timbers have the same scantling as that described at page 37, the expense would be as follows:—

			£.	*s.*	*d.*
Thatch	½ pitch, requires	300 ft. timber ..	45	0	0
Tile	⅓ „ „	270 ft. „ ..	40	10	0
Slate	¼ „ „	252 ft. „ ..	37	16	0

This is merely the comparative price of the timber; a further allowance should be made for the increased labour in framing.

The relative cost and available space obtained by walling and by roofing.—We have now to consider whether the lean-to or the ridge roof is the more economical. In point of true construction there can be no doubt that the ridge roof is the best, the tendency of the lean-to being to force the walls outwards. Now as to economy. We will give the cost of a lean-to roof for a shed 20 feet wide and 100 feet long, which can be compared with the expense of roofs as given above. The specification would be somewhat as follows: wall on one side to be built 10 feet higher than the wall for ridge-roof, and of the same materials:—

Principals 9 × 3, set 9 ft. from centre to centre.
Ridge and wall-plate 6 × 3.
Rafters 3½ × 2, set 14 in. from centre to centre.
Two sets of purlins 6 × 3.

The cost would be somewhat as follows:—

	£.	*s.*	*d.*
66 perch of 15 ft. of wall work, at 5*s.* 6*d.*	18	3	0
182 ft. of timber, at 3*s.*	27	6	0
	£45	9	0

This is presenting the most favourable aspect, for this roof is of a lower pitch than that which has been taken in other cases to which it will be compared. If the same pitch be observed, the cost will stand as follows:—

	£.	*s.*	*d.*
93 perch of 15 feet wall work, at 5*s.* 6*d.*	25	11	6
194 ft. of timber, at 3*s.*..	29	2	0
	£54	13	6

The cost of king-post roof, one-third pitch, for the same width, would be (see above), 40*l.* 10*s.*

These prices are exclusive of the cost of labour in framing.*

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* It should be remembered that this result would be modified where the shed is of less width; probably for a shed of 14 feet width a lean-to would be the cheapest. One side of eaves gutter and down-pipes, as likewise crease, are saved in the lean-to. This has not been taken into account in the comparison of cost.

Now as regards the space gained. The sectional area of the lean-to roof is in the first case 100 feet, in the second 140 feet, in the ridge roof 70 feet. However, to make this space available in the former as in the latter case, it will be necessary to add a kind of ceiling joist to each principal; this increases the cost of the lean-to roof by 1*l.* 10*s.*

When roofs should be ventilating.—It is essential to the health of horses that their stables should be well ventilated. The same remark, of course, applies to cattle and their boxes where the box-feeding system is adopted. No doubt much of the effluvia in stables might be prevented were the urine-drains properly trapped. This subject, however, the present inquiry does not embrace. The question is only how the ventilation of stables affects their roofing. The plan that at present prevails of having openings in the walls behind the horses is open to serious objection. Mr. Sturges, of Bedall, in the Royal Agricultural Society's Journal for 1850 (page 294), remarks:—

> "The old system of having openings just behind the horses or beasts, I consider defective and objectionable, as far as the perfect ventilation of the building is considered, for these separate reasons: the effluvia and impure air arising from the cattle ascending by their lightness to the top of the building, there they remain and are unable to make their escape, it being impossible to get to the openings provided, for there the cold air is rushing in. The other reason is, that the current of cold air, according to the old mode, is directed right over the backs of the animals, and is thus liable to give them cold. The plan I advocate is a ventilator (or what is commonly called louvre boarding) to be put at top of roof, and doing away with the openings. This mode will allow free egress to the impure air, as well as do away with all draughts, while at the same time there will be sufficient air admitted from the doors and windows for the perfect ventilation of the building."

Mr. John Ewart, in the same Journal, remarks (page 239) on stables:—

> "The roof should be furnished at its ridge with a cupola of wood, the sides oi which should be latticed to carry off heated and vitiated air generated by the breathing, perspiration, and excrements of the horses.

Sir Thomas Tancred, in the same Journal (page 211), thus provides for ventilation:—

> "Two slates over each box to be lifted 1 inch for ventilation, or laid 1¼ inches apart over a surface of 4 feet superficial. One glass slate to be fixed over each box; this applies to horse, cow, and pig boxes.

If the plan were adopted of laying the slates ⅓ open, as described under the head Slate, sufficient ventilation would probably be obtained without resorting to any other means.

The materials for external covering; their respective merits, defects, and cost.—The three kinds of covering most in use are thatch, tiles, and slate. To these heads we will add a fourth, to include other coverings (as asphalt-felt, iron, and zinc) not generally in use. As regards thatch we need say but little. There can be no two opinions that it is most desirable to substitute slate or tile. The increased danger from fire, and consequent higher rate of premium for insurance,* is a strong argument against its use. The specification for thatching would be somewhat as follows:—The roof to be thatched upon hazel rods, with all necessary pegs, tar, cord, &c.; the eaves and ridges to be securely tied down. The cost may be judged from the following estimate for thatching a shed 100 feet long and 20 broad, supposing the pitch to be ½, which increased pitch is necessitated by the nature of the covering. It must, however, be remembered that no exact estimate can be formed of the cost of thatch: all depends on the price of reed, which may at one time be worth 1*s.* and at another 2*s.* per bundle. The cost of labour is about 7*s.* per square. Our estimate is:—

	£.	*s.*	*d.*
28 square of thatching, at 1*l.*	28	0	0

This, however, does not constitute a fair comparison, as the cost of timbers would also be greater in consequence of the increased pitch. The repairs are likewise considerably more with thatch than slate or tile.

Tile.—Several different kinds of tiles are used; the principal are plain, pan, triple, Roman, and double Roman tile. The following statement shows about the relative cost per square of 100 feet, at Colthurst and Co.'s works, Bridgwater, February, 1857:—

	Price per Thousand.			Relative Cost per Square.				
	Red.	Dun Colour.	Black Glazed.	Tiles to the square.	1000 Tiles, computed to cover	Red.	Dun Colour.	Black Glazed.
	s.	*s.*	*s.*		sq. feet.	*s.* *d.*	*s.* *d.*	*s.* *d.*
1. Plain tiles ..	40	45	50	460	2·17	18 5	20 9	23 0
2. Pantiles	60	70	80	166	6·0	10 0	11 8	13 4
3. Triple tiles ..	120	150	180	80	12·50	9 7	12 0	14 5
4. Roman tiles ..	120	150	180	80	12·50	9 7	12 0	14 5
5. Double Romans	120	150	180	80	12·50	9 7	12 0	14 5

In the first of these the increased weight and pitch are serious drawbacks: in addition to this, a larger number of battens are

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		Per cent. premium. *s.*	*d.*
* The Phœnix fire-office charges on farm-buildings	Thatched	5	0
	Tiled or Slated ..	2	0
The Sun do. do. do.	Thatched	4	6
	Tiled or Slated ..	1	6
The Times do. do. do.	Thatched	5	0
	Tiled or Slated ..	1	6

required. In consequence of the smallness of the tiles this covering is now seldom used.

In the second the defects are—liability to rip in windy weather, and difficulty of laying so as to prevent leakage. Although it is somewhat cheaper than triple, it costs 1*s.* a square more in laying, besides which an increased number of battens is required, so that there is little or no gain over triple or double Roman, which undoubtedly constitute a much superior covering.

The triple, Roman, and double Roman are all good. The latter are the most recent, and are highly recommended by those who have used them, including in their number R. K. M. King, Esq., Walford House, Taunton; Mr. Robert Carter, Impnis Farm, North Petherton; Mr. William Hembrow, Stoke St. Gregory, Taunton; Mr. George Parsons, Martock. Messrs. Colthurst and Co., of Bridgwater, thus speak of the double Roman tile:—

> "They are (and have been for some years) extensively used in the western counties for farm buildings, on account of their close fitting, and principally because they are the cheapest covering yet introduced."

They lathe 13½ inches, and effect a considerable saving in cap-laths. The patent ridge matches this tile, and costs 5*s.* 6*d.* per dozen; each ridge-tile is 18 inches long: thus the cost per foot run is 3¾*d.* The pitch at which these tiles can safely be laid is ⅓, although Messrs. Colthurst say they should not fear to lay them at ¼. The cost per square at Bridgwater would be somewhat as follows for double Roman or triple tile:—

	s.	*d.*
Tiles	9	7
Eight feet of laths	4	0
Labour	3	0
	16	7

Whilst speaking of tiles, we will refer to a contrivance for strutting (Beadon's eaves gutter-tile), which seems well adapted for farm-buildings. This system of gutters or spouting may be applied to any kind of roofing, whether thatch, slate, or tile; and also to garden and other walls, as coping. Once fixed, it will last, without paint or repair, as long as the building itself. The upper part of the tile occupies a large space of the roof as covering (about 100 square feet in 100 feet run), effecting a great saving in slate or tiles, the lower part alone forming the gutter. The usual descending eaves are not required, and the walls need therefore only be carried up to the same height from the ground as the point to which the eaves and spouting would descend in the ordinary way. In agricultural buildings this is an important consideration. By the patent gutter the building may be spouted, and yet the headway be sufficiently low to cut off the "stroke" of the wind, and be out of the way of cattle or the labourers. They are so firm as to bear any weight—such as ladders, &c.—against them; and when they are fixed are never any trouble or expense afterwards. Should a joint be broken by the "settling" of the building, a little coarse paint will at once stop all leakage. The tiles are nailed to the rafters or to a thin batten laid along the feet of the rafters and cemented together at the joints with Portland or other imperishable cement. The present lap or joint of the tiles is ½ inch; it would perhaps be an improvement to increase this to ¾ inch. The following is, we are informed, the present cost of these tiles, viz.:—

4*d.* each tile of from 12 to 13 inches long; stops and outlets 6*d.*

Slates.—These are (somewhat whimsically) distinguished according to their size, as duchess, marchioness, countess, viscountess, and ladies. Their relative cost and weight will be seen from the following statement, compiled from the price-list of Messrs. Bagshot, of Bridgwater:—

Best Welsh Slates.	Size.	Number that will cover a square.	Price per 1000 at Bridgewater, Feb. 1857.	1000 computed to cover sq. feet.	Relative Cost per square.	Weight per 1000.
			£. s. d.		£. s. d.	Cwt.
1. Duchess ..	24 × 12	120	9 12 6	8 33	1 3 1	50
2. Marchioness	22 × 11	144	7 2 6	6 94	1 0 6	42
3. Countess ..	20 × 10	168	6 2 6	5 95	1 0 6	33
4. Viscountess ..	18 × 9	216	3 15 0	4 63	0 16 2	25
5. Ladies	16 × 8	276	2 17 6	3 60	0 15 10	21

The two last, 4 and 5, are seldom used; when employed, the roof has first to be boarded over. The relative cost of duchess and countess would be somewhat as follows per square:—

Duchess.

	£.	s.	d.
Slates (see Table)	1	3	1
1 doz. 12 ft. red deal battens, 1½ in. × ¾ in.	0	6	0
Copper nails, 2 nails in each slate, 1½ lbs. to the square	0	3	0
Labour per square	0	4	0
Total for one square	£1	16	1

Countess.

	£.	s.	d.
Slates (see Table)	1	0	6
Fourteen 12 ft. red deal battens, 1½ in. × ¾ in.	0	7	0
Copper nails, 2 nails in each slate, 2 lbs. to the square	0	4	0
Labour per square	0	4	0
Total for one square	£1	15	6

Slate constitutes the best known covering—neatness, lightness, and strength being combined. If nailed in the middle it cannot rip in windy weather. The bond* should not be less than 3 inches. Each slate should be nailed with two copper nails; if iron nails are used they are liable to rust off. Slates are generally laid to ¼ pitch. In sheltered situations slate might be laid ⅓ open, that is to say, the slates might be laid 3 inches apart for countess and 4 for duchess: a saving of ⅓ is thus effected. The Bath Goods' Station is thus roofed, and has answered well.

It may be stated that Bath stone crease for slate costs 3*d.* per foot run at the quarry; plain slate crease 7*d.* per foot run; slate crease with 2½ in. roll 14*d.* per foot run.

To contrast the relative cost of thatch, tile, and slate, it is necessary that the pitch be also considered. Below are subjoined estimates of roofs with each kind of covering for a shed 20 feet broad and 100 feet long. The roof in each case is supposed to be a king-post one, with timbers of the following scantling: the cost of labour in framing is omitted in each case:—

Principal	9 × 3
King-post	9 × 3
Tie-beam	9 × 3
Ridge	6 × 1½
Strutts	6 × 3
Purlins	6 × 3
Wall-plates	7 × 3
Rafters	4 × 2, set 14 in. from centre to centre.

The principals are supposed to be set 9 feet apart in each case.

First Estimate for Thatch.—Pitch ½.

	£.	s.	d.
28 square of thatching, at 1*l.* per square	28	0	0
330 cubic feet of timber, at 3*s.*	45	0	0
	£73	0	0

Second Estimate for Tile.—Pitch ⅓.

Covering Double Roman Tile.

	£.	s.	d.
24 square of tiling, at 16*s.* 7*d.*	19	18	0
270 cubic ft. of timber, at 3*s.*	40	10	0
	£60	8	0

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* The meaning of the word "Bond" is well explained by the following extract from Morton's 'Cyclopædia of Agriculture:'

"The first or eaves course is laid double, the second layer of slates covering the joints of the first. Then to find the gauge or distance of the horizontal lines of the slates, from the length of the slate deduct the bond or overlap, and half the remainder is the gauge; the bond being the distance that the third course of slates covers over the top of the first. The second course is then laid to this gauge. The third course is laid to cover over the top of the first to the extent of the bond, which, in the lowest courses, should be from 2½ to 3 inches, but may be reduced to 2 inches as they approach the ridge."

Third Estimate for Slate.—Pitch ¼.

Duchess.	£.	s.	d.
22 square of slating, at 1*l.* 16*s.* 1*d.*	39	13	10
252 cubic ft. of timber, at 3*s.*	37	16	0
	£77	9	10
If the slates were laid ⅓ open, there would be a saving of about	13	0	0
	£64	9	10

Although the cost of slate appears to be so much greater than that of tile, it should be remembered that it requires less repair. Mr. Stephens, in his 'Book of the Farm,' says,—"Of all the methods of covering a roof, slating with blue slates has the best appearance—is the most comfortable, most substantial, and even most economical in the long run. Tile roofs, on the contrary, are constantly requiring repairs, and are most expensive in the long run" (vol. ii. p. 532).

Iron and zinc.—The use of these for the covering of farm-buildings cannot be recommended. The galvanised iron roof at the Bristol Station of the Bristol and Exeter Railway Company failed, and had to be replaced by one of slate. Zinc was used at the Bath Station on the Great Western Railway, and in the laps where the paint could not be renewed the metal rusted into holes.

Asphalt felt.—This should not be used as a permanent covering. Below is given an extract from the Royal Agricultural Society's Journal, 1850 (p. 268), in which its temporary use is suggested:—

"It may sometimes so happen that a tenant-farmer may wish to increase the accommodation in his farm buildings, and that his landlord may either not be in a position, or may be unwilling, to comply with such desire. In such a case it cannot be expected, how much soever it may be to his interest, that any tenant, as the law at present stands with regard to improved buildings by tenants, would erect expensive permanent buildings at his own cost, but many tenants might be willing to incur a comparatively small cost in increasing the accommodation of his farmstead, if his purpose was likely to be answered thereby. To such readers as may be circumstanced as above-mentioned, the following extract from a paper on cattle-sheds and folds in the second volume of the 'Plough' is recommended to their notice.

"'Suppose a range of sheds to be commenced at the angle or corner of a fold-yard, and ranged along one side of it; let the wall or fence of this side be carried up to 9 feet, if not already that height, with rubble-walling sufficient to keep out the wind; this will serve for the back, and a wall at a right angle, forming the corner, will answer for a side of the intended range of sheds. Let rough posts, 5 inches diameter at the smaller ends, ranged in a straight line parallel to, and 12 feet distance from the back wall, and at 12 feet distance from each other, be sunk 1½ or 2 feet into the ground, and rising 6 feet above the surface; the part underground, and for 6 inches above, should be well charred to prevent the posts rotting, which they are very liable to do at the part immediately above and below the surface. Of all kinds of wood, larch is best suited for the posts. Let beams or joists extend from post to post, resting on and firmly spiked to them; these joists, set on edge, need not be more than 4⅓ inches by 2⅓ inches, or two-thirds the breadth and thickness of a Norway batten, which kind of deal will answer the purpose admirably, and save expense in labour and stuff. Let three principal rafters, of 4⅓ inches by 2⅓ inches, extend from the tops of the posts to the back wall, at 9 feet high, with a purlin of the same scantling running across at their mid-length. Let also rafter-spars, 2½ by 2 inches, cut from Norway battens of their breadth into three, proceed from the top of the joists in front, resting on the purlines and extending to the back wall firmly fixed to a spar fastened to the wall; these small rafters should be at 2 feet intervals. And lastly, let eaves-board, ½ inch thick, the breadth of a batten, be placed across the ends of the rafters in front, and projecting 4 inches beyond the line of the tops of the posts, and similar boards across the ends of the rafters next the back wall; then across the rafters, in the space between the boards, let laths 1 inch wide and ½ inch thick be nailed at intervals of 15 inches. The shed will now be ready to receive the paper covering, which will next be described.

" 'The description of paper most suitable for the purpose of roofing is that used for laying on ships' bottoms under copper sheathing, and known by the name of sheathing-paper: a very common size of which is 30 inches by 24 inches, and weighing about ½ oz. to the sheet; such size is exactly that to suit the roofing specified above. The paper is prepared and laid on in the following manner, viz.: cover one side of the sheets of paper with hot coal tar, and whilst the tar is still hot, dredge or sift on it as much dry sea or clear washed river sand, well dried in an oven, as will adhere to the tar; then cover the sand, when the tar has become cold and set, with a thick coat of lime slacked with a saturated solution of alum or soda; this whiten-ash should be of the consistence of thick cream, with a portion of glue or other sizing matter in it. Let the sheet of paper thus prepared be laid on the roof with the prepared side downwards, and nailed to the laths with five short and very flat-headed scupper-nails; and so cover the entire roof with prepared sheets of paper, the edges of which must be laid as closely together as possible without overlapping. The upper side of the paper thus laid on must be thickly and evenly covered with hot coal tar, and another stratum of paper laid upon it, after which the outer side of this second stratum must be prepared with coal tar and sand, in the same manner as the under side of the first.

" 'To make the roof complete, it should be neatly pointed with Roman cement wherever it may join any wall, in order to prevent any wet finding its way in at the junction. To finish all, the whole must be covered with a limewash, described above, to which a slate, tile, or stone colour, may be communicated by the addition of a little lamp black, Venetian red, or umber.

" 'This will form an extremely durable covering, quite impervious to rain, and perfectly safe from fire, and at a very trifling expense; the whole of the timber used in the construction of the shed may be rendered fire-proof by being immersed for 24 hours in a saturated solution of alum or soda.

" 'At the present prices of materials and labour, the cost of shed and fold for 32 square yards complete, according to the specification above (carriage of materials not included), will be as follows, viz.:—

	£.	s.	d.			
Timber for the shed, sawed to the proper dimensions	0	17	6			
Labour in putting up and nails	0	7	6			
				1	5	0
Hurdles of larch for fences				1	0	0
Paper for covering, at 28*s.* per cwt...	0	8	0			
Preparing and laying on	0	7	0			
				0	15	0
Sundries for levelling ground, &c.				0	4	0
Total				£3	4	0

" 'Or at the rate of 2s. per square yard for shed and fold, an expense which would be repaid in a single year by the benefit that would be derived from the conveniences.' "

6. *The expense (including timber and covering) involved in a change from thatch to any more durable covering.*—It frequently happens that thatched roofs are of a very rude construction, little regard being paid either to the scantling of the timbers or the laying of the rafters. In such cases small use can be made of the old materials; and the cost of substituting a more durable for a thatch covering would be the cost of a new roof as given above, plus the labour of removing the old one.

In those cases where the timbers and rafters can be made available, it is clear that no definite estimate of expense can be given without a more specific account of the extent to which they can be used; so that the cost must be determined independently in each individual case. Supposing the timbers, &c., to be in a sound condition, it will be seen, from what has been said above, that the expense of substituting double Roman or triple tile for thatch would be 16*s.* 7*d.* per square of 100 feet, while the cost of replacing thatch by countess slate would be 1*l.* 15*s.* 6*d.* per square of 100 feet. This, however, is based upon the supposition that double Romans or triple tiles could be obtained at 6*l.* per 1000, and countess slate at 6*l.* 2*s.* 6*d.* per 1000, the present price at Bridgwater.

To sum up, then,—we have little new to suggest in the *framing of roofs* beyond the use of iron for such parts of the roof as have to resist the force of tension.

The strongest and best form of roof is the king-post; but for most agricultural buildings a lighter, such as the collar-beam roof, will answer. From the limited size of farm-roofing it has not been considered necessary to allude to the queen-post roof and other trussed roofs.

Care should always be taken that the roofs should be tied, as the safety of the walls is endangered when this is neglected.

With regard to the covering, we may mention the double Roman tiles as being well adapted for agricultural buildings. We have further to draw attention to Beadon's patent eaves gutter, and the patent crease of Messrs. Colthurst and Co., Bridgwater.

Whatever course the farmer may take, whatever kind of roof he may prefer, let him never sacrifice stability to cheapness, but remember, in the words of our motto, that "*Our English word 'to build' is the Anglo-Saxon Byldan, to confirm, to establish, to make firm and sure and fast, to consolidate, to strengthen; and is applicable to all other things as well as dwelling-places.*"—'*Diversions of Purley.*'

IV.—*Beans and Peas.* By Professor JOHN DONALDSON, Author of various Agricultural and Scientific Works, and of Prize Essays.

PRIZE ESSAY.

I. BEANS.

BEAN is a Saxon word, and used to designate an edible pulse of the leguminous kinds. The bean is a native of the eastern world, having the first notice in Persia, whence it may have been carried into Egypt during the domination of that country by the former people. Under the high suns, and on the damp and rich alluvial soils of lower Egypt, that are formed by the depositions of mud from the overflowings of the river Nile, the bean had found a most congenial habitation for its development. The produce was extensively cultivated, and spread along with the Egyptian colonies into Greece, Barbary, and Spain. It was largely used in the agriculture of the Romans, and found its way over Europe and was introduced into Britain at an early period.

The bean plant belongs to a most important family in the vegetable kingdom, the seeds growing in pods or legumes, so called from "lego," to gather by the hand. It forms an important order in the natural arrangement of Jussieu, which has the following characters :—calyx five-parted, or toothed, or cleft, with the odd segment anterior; segments often unequal and variously combined; petals five (or, by abortion, four, three, two, one, or wanting), inserted into the base of the calyx, usually unequal, sometimes variously combined, the odd petal superior; stamens definite or indefinite, inserted with the petals, or sometimes hypogynous, distinct or monadelphous, or diadelphous, or rarely triadelphous; anthers bilocular, versatile; ovaria superior, one-celled solitary, or very rarely 2-5; ovules one or many; style simple, proceeding from the upper or neutral suture; stigma simple. Fruit, a legume or drupe. Seeds, solitary or several; sometimes with an axillus. Albumen none. Embryo straight, or with the radicle bent upon the edge of the cotyledons. Leaves alternate, with usually two stipules at the base of the petiole, and two at the base of each leaflet in the primate leaves. Pedicels usually articulated.

The artificial arrangement of Linnæus places the bean in the order having ten male organs united in two divisions, bundles, or brotherhoods, or the "Diadelphia decandria" of that botanist. This division very nearly agrees with the natural order "Leguminosæ" of Jussieu.

This family is among the most valuable to man, whether as affording objects of beauty, of utility, or of nutriment. The bean, the pea, the vetch, and the clover belong to it, as do the logwood, the laburnum, indigo, the tamarind, senna, and the acacias. Its general property is to be wholesome, but there are several exceptions. The seeds of laburnum are poisonous; senna, and some other kinds, are purgative; and the pericarp of some contains much tannin. The bean possesses the latter quality.

The vetch is an extensive family of the leguminous order of plants, and comprehended the bean as a species under the name of "Vicia faba," and belonging to the second division, with the flowers axillary, and nearly sessile. The generic character of the vetch:—Calyx: perianth, one-leafed, tubular, erect, half-five-cleft, acute; upper teeth shorter, converging, all of equal breadth. Corolla papilionaceous. Banner oval, with a broad oblong claw, at the tip emarginate with a point, bent back at the sides, with a longitudinal compressed raised line. Wings, two, oblong, erect, half-cordate, with an oblong claw shorter than the banner. Keel, with an oblong two-parted claw, the belly compressed, semi-orbicular, shorter than the wings. Stamina, filaments diadelphous, single and nine-cleft. Anthers erect, roundish, four-grooved. A nectareous gland springs from the receptacle between the compound stamen and the germ, short, acuminate. Pistil, germ linear, compressed, long. Style, filiform, shorter, ascending at an erect angle. Stigma obtuse, transversely bearded below the tip. Pericarp, legume, long, coriaceous, one-celled, two-valved, terminated by a point. Seeds, several, roundish. Essential character—stigma transversely bearded on the under side.

The bean has been observed to differ from the vetch in having large tumid pods which are coriaceous, and half filled when young by a soft cellular matter, in the seeds being oblong, and in the hilum or scar being terminal on the end, and not on the side of the seeds. The Faba of Tournefort has oval compressed seeds; the vetch of that author and Rivinus has roundish seeds. These distinctions have been admitted as sufficient to constitute a genus, and the bean is now the "Faba vulgaris" of botany, stands alone, and has no congener.

The cultivated bean has the flowers axillary, nearly sessile; stalks with several flowers, very short; legumes ascending, tumid, coriaceous; leaflets elliptical, acute, entire; tendril abortive; stipulas, half arrow-shaped, toothed at the base; annual, flowering in June and July; stem, three to five feet high; leaflets smooth, larger, acute, at each end, and alternate; flowers, from six to ten, and more, on a short racemose stalk, deliciously fragrant, white, with a broad black velvet-like spot on each wing; calyx whitish, with ovate taper teeth; legume large, thick, oblong, pulpy within while unripe, containing four or five seeds; root tap-shaped, descending with lateral fibres.

Beans have been cultivated into many varieties, of which the most select are, the horse bean, tick bean, and the Heligoland bean. The long pod and mazagan variety are seldom sown in the field; the Russian or winter field-bean has been sometimes successfully cultivated. The horse and tick beans differ little, and only from circumstances of soil and situation; the Heligoland bean is hardy and short; strewed with small seeds, it suits the richest alluvial soils, but in all ordinary cases is inferior to the common bean. The winter bean is suited to the southern and central districts of England, not much above the level of the sea, where the winters are mild, and on well-drained lands the weight of a bushel exceeds the other varieties.

The bean plant delights to grow on clay soils of the best quality, and also thrives on lighter lands that have a firm and adhesive subsoil. The lands that produce wheat are the soils most favourable to beans, or the strong loams that yield crops of Swedish turnips and mangold wurtzel, occupying a middle position between stiff and waxy clays and light loams, and possessing firmness, dryness, and depth: shallow lands of all kinds are unsuited. Beans are cultivated in broad-cast crops, or in drills with narrow or wide intervals, as the nature of the soil and benignity of the climate may allow. In the former way, the treatment is exactly the same as with oats; the seeds are scattered on the surface, and covered by harrowing. On the Plastic and London clays the broad-cast cultivation of beans is imperatively practised. The waxy and very tenacious nature of the soil wholly prevents any drilling or dibbling of the seeds, and the crop being thinly planted on these poor lands, the weeds are checked by hand-hoeing, while the stems are young and low, but no pulverization of the surface is effected by that light implement, nor are the weeds much destroyed. The open furrows bare of plants permit the seeding of weeds, and the operations confer a small benefit. On those lands beans are introduced on the wheat stubble, and fallowed by a crop of oats, which is succeeded by fallow, thus deferring the clover crop to once in eight years instead of four in the rotation. The roots of beans penetrate and divide the soil, and resemble a green crop in some degree, and the exudatory quality attributed to the plant is supposed to benefit land in a degree that justifies the use of beans as a crop, even in broad-cast, which is often worse in appearance than a crop of grain. The plants being thinly set, the ground is bare and exposed to aridity, becomes parched and baked, and no way softened and mellowed. Weeds are matured into seeds after the hand-hoeings are done, and the farming is foul and slovenly. Even on the best modifications of these marine formations of viscous clays, where the overlapping of the deposits are mixed with the débris of the underlying chalk and chalky marls, the broad-cast system is followed from necessity, and the farming is still foul, though the surface ground is well covered by thickly set plants, a partial hoeing is performed, and a fair produce is obtained. Weeds escape being cut in the early season, and rise after the hoeing is done; the sides of furrows and the ends of the ridges afford room for weeds to be matured, and even among the crop of plants these pests will grow and rear their seeds. The grown crop prevents the cutting or pulling of the weeds. The average return from these pure clays is about 16 bushels per acre, and on the mixed clays and chalks it will be 24 bushels. On the pure condition of clay lands in the lias, clunch, Kimmeridge, and gault formations of that body, beans are cultivated in the broad-cast manner, as the tenacious soil does not allow any preparation or drilling. Thick sowing and a fair quality of land raises good crops, which shade the surface, and divide the ground by the roots, and a useful purpose is answered. In some cases, ribbing by the miniature plough may be done on the well-harrowed surface, on which the beans are sown by hand, fall into the drills, and are covered by the harrow. Hand-hoeing of the crop can be done, but no operation of the horse-hoe.

On the clay soils that are modified from the Plastic and London deposits, lias, clunch, and Kimmeridge clays, by a mixture of chalky débris, and on the clay lands of Essex that have been washed by fresh water from the Plastic and London formations, and divested of much of the viscous tenacity, beans are cultivated in rows of nine inches to two feet, by placing the seeds in holes made in the furrow slice of the deeply ploughed stubble land, and covered by a light harrowing. This mode of cultivation is the first departure from the broad-cast system, where the soils do not permit any stirring of the land in autumn or in the spring, and with rows of 18 inches distance a very good cleaning of the crop and of the land is effected by two or more operations of the hand-hoe before the crop is grown to exclude the workers. Horse-hoeing is done but imperfectly; the implement cannot pierce the underground that is unmoved from the winter furrow, and no tilth is raised to encourage absorption and evaporation. Still a scarifying is useful to destroy surface weeds, and to assist the hand-hoe. The plants soon cover the intervals, and prohibit later operations. Good farming is performed in this way, and large crops are obtained, of 50 to

60 bushels on an acre. The lands are of a good quality and suited to the bean plant.

Where the chalk has mixed the clays into a friable soil of moderate dryness, the surface of the deep winter-furrow being well harrowed, beans are sown by the corn-drill at intervals of 9 to 18 inches, by means of cups and coulters provided for the purpose, the latter to penetrate the ground as deeply as possible and to hold the seeds. A light harrowing finishes the process. The miniature plough drawn by one horse opens furrows on the harrowed surface at any distance apart—the beans are sown by hand and fall into the ruts, in which the seeds are covered by the harrow. These two modes are very convenient, and form a good practice—hand-hoeings are well performed and weeds destroyed—the horse-hoe scarifies the intervals during the young age of the plants, and if the land be tolerably mellow the operation is beneficially executed. Flat grounds do not allow the full benefit of horse-hoeing as in hollow intervals—the same depth cannot be reached, nor an equal working of the loosened earth. Where a dry friability of the soil permits, very good bean husbandry is managed by sowing on the harrowed surface of the deep winter ploughing, with the corn-drill placed at proper intervals, and by ribbing with the miniature plough. But there are understood soils of good quality, and with a wide departure from the marine clays of viscous nature, by being mixed with chalk and earths. These lands occur in the vicinity of chalk hills; and in the intervening valleys, in which the deposit of clay is not very deep, good bean lands are found, and capable of producing large crops of wheat, as the one crop secures the other.

The next mode of cultivating beans occurs on lands so friable as to permit a preparation of the ground in autumn or in the spring, and the drilling into wide intervals with the application of farmyard dung. The perfection of bean farming is found in this system of culture. Beans delight in deep tilth, and the stubble ground must be ploughed in autumn with the strength of three or four horses, and 8 inches in depth of furrow, as the ground may allow. Farmyard dung in a thoroughly wet and half-putrescent condition, rank but not dry, has been spread over the stubble ground, at the rate of twelve two-horse cartloads on an acre, and is covered by the ploughing. In the dry weather of spring, the ground is well harrowed, or ploughed, or broken by contrary workings of a grubber, and drilled into intervals of 27 inches, in which the beans are sown by drill barrow, and covered by splitting the drills over the seed, or sown broad-cast by hand, when the seeds fall into the ruts, and are covered by reversing the drills. The ridglets are lightly rolled and gently harrowed before the young plants appear, in order to break the surface that may have been crusted by the roll. When the plants are about two inches above the ground, the paring plough or miniature implement drawn by one horse, ploughs the intervals deeply by taking a furrow from each side of the drill and placing it in the hollow; the light scuffler with knives performs the subsequent workings, which are continued so long as weeds arise, and the growth of the plants allows the ingress of any work by implements and animals. Hand-hoeing follows each scarifying of the intervals, cutting every weed, and passing the hoe between the plants, in order to break and pulverize the soil. The full growth of the plants stops the operations, and some practices earth up the drills with a double mould-board plough. This mode of cultivation is performed on fen lands and on deep earthy loams; and it forms the most perfect system of bean farming.

The bean plant has fixed a chosen residence in the county of East Lothian, in the South of Scotland, where the soil and climate combine in forming a very successful cultivation. The deep loamy clayey concreted gravels near the town of Dunbar, and the red rolling clays that overlie the traprocks south from North Berwick, exhibit the cultivation of beans in a manner that is unequalled and not attempted. The system places beans on an oat stubble, on which farmyard dung is spread, and ploughed under by the winter furrow. The land is drilled in the spring, the beans sown, and covered by reversing the drills, and cultivated during summer by the horse and hand-hoe. The now preferred mode works the land by ploughing and grubbing, and all weeds are picked and removed. Drills are opened by the common plough, and farmyard dung is spread along the hollows, over which the beans are sown by seed machine, and the drills are reversed. The roll levels the drills, and the harrow breaks the crusted surface just before the beans protrude. When the plants are risen into height of two inches, the paring or miniature plough drawn by one horse lays a deep furrow from the sides of each drill into the interval, which is several times scarified by the drill grubber, and accompanied by the necessary hand-hoeings. Weeds are carefully destroyed by the hoeings and grubbings, and not one allowed to grow. Sometimes the drills are earthed up by the double mould-board plough. A visitor to the North Berwick district of that county in the end of July will behold the bean farming exhibited in the greatest luxuriance. A large field of beans covered with gay flowers, with a rambling pea flaunting here and there like standard-bearers amongst a crowd, the air filled with the happy murmurs of the cottagers' bees, affords one of the most pleasant and delightful sights that can be found in the whole range of British agriculture. The clays of Scotland are fresh-water formations on the primitive rocks, and possess a loamy friability that permits a preparation for beans not to be obtained on the marine argillaceous deposits of England, fen lands and estuary formations excepted.

In the climate of East Lothian, snows and frosts will happen and stop the bean-sowing in February and March. Farmyard dung has been deposited in heaps or spread along the intervals, and has been exposed in that condition to the rains and snows, winds and suns; washed, bleached, and dried. Yet the crops were equal to the usual way of covering the dung when deposited, and in certain cases a superiority was acknowledged in the dung that had been exposed. Many years have tested the observation, and however much it may clash with the doctrines of chemistry about exposure and loss by evaporation, such facts are stubborn things.

On the carse lands of Gowrie and Falkirk, that are rich soils under a more northern climate, beans cannot be drilled, but are cultivated on the thick sowing broad-cast system. The harrowing of the surface of the winter furrow may be done and ribbed by the small ploughs; but the climate may prevent these operations at the early period of the year when beans are sown. Except in the Lothians and in Fife, drilling of beans is not done in Scotland.

Beans never thrive better than on grass layers of firm land, the surface well harrowed, and the seeds dibbled into the furrow-slice. It forms a most excellent preparation for wheat; but as grass lands are already in good heart from stiff layers, the benefit to the land from beans is better conferred on a stubble from a crop, and with a portion of manure to provide for the wheat.

The season of sowing beans extends from the middle of February to the middle or end of March. Earlier sowings are not allowed by the seasons, and later have been attended with inferior crops, though accidental cases have met with success, when earlier and later performed. The quantity of seed for an acre is about 3 bushels, and the average crop yields 30 bushels from the same quantity of ground. The weight of a bushel of grain averages 65 or 66 lbs., the winter bean often reaching 70 lbs. This variety is beneficial in the southern and central districts of England, under mild winters and on drained lands not much above sea-level: sown in October, a part of the farm work is relieved in the spring, and the crop of beans is reaped in time almost to allow a crop of early white turnips on the scarified surface. These advantages may extend the use of the bean, though no greater price or produce yet induces the system.

The shrivelling of the haulm of beans, and the blackening of the pods, show the ripened condition of the crop; a dead black colour of leaves and pods exhibits an over ripeness, which subtracts from the value of the fodder, unduly hardens the grain, and renders the colour of the meal to be brown. The best sign is the leathery appearance of the leaves interspersed with green spots, and the separation of the grain from the pod at the eye: the future ripening is done in the reaped condition. The stalks are cut by hand-sickle, and laid across the drills to be dried, then tied into small sheaves by straw-ropes and placed in shocks. The tying into sheaves is also done immediately on being reaped, without lying across the drills to be dried. When sufficiently dried, the crop is carried to the rickyard, and built into a long rick on staddles, or over a tool-shed, which permit the access of air underneath. The rick must be thatched with little delay, as the rains easily sink into the openings of the bean straws and sheaves. The separation of grain and straw is easily done by flail or machine, and the grain is very easily cleaned from chaff, and is then fitted for market or home use. The leguminous plants possess a slight attachment of stalks, leaves, and grains.

The haulm of beans in a well-harvested crop, with the leaves attached to the stems, is very particularly relished by horses, and the husks of the legumes by sheep, and it forms in any shape a very useful short litter for swine in sties. In a good state it is reckoned equal to the best hay of any kind or quality. The decomposition of the stalks is slow into rotten dung; but the mixture with other matters facilitates the process, and the brittle quality yielding small pieces of haulm, the stalks are easily buried in the drills of green crops, or in the furrows of clay fallows for wheat.

The ashes of bean straw contain in 100 parts:—

Carbonate of potash	3·32
" of soda	6·06
Sulphate of potash	32·4
Common salt	0·28
Carbonate of lime	39·50
Magnesia	1·92
Phosphate of lime	6·43
" of magnesia	6·66
" of iron and alum	3·49
Silica	7·97
	100·00

Beans are chiefly used for feeding horses, and are mixed with oats, after being split by a mill for the purpose of separating the lobes or cotyledons. The tannin contained in the pericarps serves to bind the muscular frame of the animal. The meal of beans is unpalatable to most stomachs and very indigestible, and is little used for human food. It is given in mixture with water to fattening animals with much benefit, and also to hogs along with steamed potatoes. Beans unbroken are yet given to bacon hogs in the last month of fattening, as it makes the flesh white and firm. Some beans are also mixed with new wheats in grinding, and millers continue to use a due proportion, pretending that the clammy new wheats will not grind well without some such mixture.

The proportion of straw to grain in the field bean is as 57 : 43. The following is the average composition of the grain :—

	Field Beans.	
	Dried in air.	Dried by heat.
Legumine	23·30	27·34
Starch	36·00	42·25
Fatty matter	2·00	2·35
Grape sugar	2·00	2·35
Woody fibre	10·00	11·73
Pectic acid	4·00	4·69
Gum	4·50	5·28
Ashes	3·40	4·01
Water	14·80	..
	100·00	100·00

This analysis gives the following results of nutritive substances :—

		Field Beans.	
		Air dried.	Heat dried.
Nitrogenous matter		23·30	27·35
Matter free from nitrogen	Starch	48·50	56·92
	Woody fibre	10·00	11·73
Ashes		3·40	4·00
Water		14·80	..
		100·00	100·00

Legumine is a nitrogenous substance, and practically identical with cheese, or the casein of milk. Beans contain about 25 per cent. of legumine, but varying with the quantity of water that is present, which differs from 13 to 16 per cent.

Mineral constituents of beans in grain and straw :—

	Bean.	Straw.
Silica	9·88	3·86
Phosphoric acid	31·87	7·35
Sulphuric acid	4·50	3·21
Carbonic acid	1·94	22·73
Lime	8·65	21·29
Magnesia	6·55	4·88
Peroxide of iron	0·36	0·90
Potash	42·13	21·26
Soda	0·90	4·56
Chloride of sodium	1·90	9·05
„ of potassium	0·34	0·90

The produce of an acre in nutritious matter at an average crop of 30 bushels, weighing 1980 lbs., at 66 lbs. per bushel:—

		Lbs. per acre.
Nitrogenous matter flesh-forming		460
Organic matter, free from nitrogen, heat giving	Starch	970
	Woody fibre	198
Mineral matter		67
Water		285
		1980

The proportion of nutritive matter in beans, compared with other grains, is thus given by Einhof;—

	Per cent. by weight.	Lbs. in a bushel.
Wheat	74	about 47
Rye	70	„ 39
Barley	65	„ 33
Oats	58	„ 23
Beans	68	„ 45
Peas	75	„ 49
French beans	84	„ 54

Beans contain in 10,000 parts about 200 parts of potash. Beans on an acre of 25 bushels at 64 lbs. yield 450 lbs. of gluten, albumen, and casein; 672 lbs. of starch, gum, sugar, and fat; 256 lbs. of water.

The ashes of beans contain:—

Phosphate of potash and soda	68·59
„ of lime	9·35
„ of magnesia	19·11
Sulphate of potash and common salt	1·84
Silicate of potash	1·11
	100·00

100 parts of beans yield 5·51 of ashes, which contain per cent.:—

Potass	24·50
Soda	2·85
Magnesia	3·84
Lime	32·83
Phosphoric acid	5·75
Sulphuric acid	2·83
Silica	3·96
Peroxide of iron	3·44
Chloride of sodium	1·89
„ of potassium	1·36

The average ratio of kernel and husk in beans is as 85 : 15.

The bean plant is affected by one formidable disease, the Blight, caused by the attacks of a most voracious species of aphis, known as the black Dolphin-fly, which devours or perforates the leaves, destroying the functions of absorption and assimilation. The top leaves are first destroyed, the fly working downwards, leaving half-developed pods in rows on mummy-like stalks. The crop may be much saved by cutting off the tops when first affected, and carrying away and burning the diseased cuttings. Warm summers of a peculiar nature produce this pest of the bean crop. A species of wireworm enters into the seeds in cold wet seasons and produces the rot; weevils nibble the young leaves of beans; the Dolphin or plant-lice smother the flower buds and stalks; the humble bees tap the blossoms and render the pods imperfect, if not abortive; and the little beetles lay their eggs in the flowers, and prey upon the ripe seed. Soot dropped into the ground with the seeds might probably stop the wireworm; the weevils are best attacked at night, when they come out to feed; by cutting off the tops of the beans when first affected, the lice may be subdued; and the larvæ and pupæ of little beetles may be destroyed by steeping the seeds in brine, or by immersion in hot water.

The medicinal qualities of beans are said to be nutritive, but flatulent, from the quantity of air disengaged in the decomposition, and which cannot be again absorbed during the digestion. The pods yield a water held good against the gripes in children. The bean has been used as a succedaneum to coffee, which in principle it much resembles, only that it contains but half the quantity of oil. The roots of the bean are useful diuretics in dropsical cases, bruised and boiled in water; ½ lb. of roots to a quart of water, and reduced to a pint; two spoonfuls taken every morning.

The expansion of beans in growing is very great, one bean being sufficient to raise a weight of 100 lbs.

Every enlightened practice recommends the application to beans of farmyard dung in a thoroughly wetted and scarcely putrescent condition, and composed of the usual quantity of straws and animal excrements. In this state the roots of the bean indulge a very thriving pleasure to search among the rank manure, and, when the tap-root descends, the lateral fibres spread among the dung and derive a most luxuriant nourishment. Top-dressings in any substances produce foliage rather than grain, and on leguminous plants the tendency is more powerful than on culmiferous crops. Dissolved bones, lime, gypsum, glauber salts, common salt, nitrates of soda and potash, have been recommended for beans, to be sown on the young plants and mixed with the soil by horse and hand-hoeings. Gypsum and lime require a long time for solution, and should be applied to the land before sowing the seed, or the gypsum along with the seed. Lime may be wrought into the land with the hoeings or laid on the winter-furrow and on the surface, and scarified into the ground. But no decisive trials have fully sanctioned the use of any top-dressings for these crops, nor any kind of putrescent manure beyond farmyard dung, laid in the drills or spread upon the surface of stubbles. When dung is applied, the cattle-yards afford the materials. Top-dressings assist a bad crop, rather than produce a good one.

All experience agrees in sanctioning beans as an excellent preparatory crop for wheat, and that the plant bestows greater benefit on the land and subtracts less from the soil than any other cultivated vegetable of the farm. But the crop must be drilled, horse and hand-hoed, dibbled and cleaned by hoeings, or thickly planted in broadcast, in order to cover and shade the ground. A blank, thin, straggling crop of beans, low in stature and puny in growth, exposes the land to exsiccation and aridity, and affords empty room, in which weeds are matured and propagate their kinds. In these cases, on the poorest clays beans must be avoided as a crop, being worse than any grain-crop in filling the ground with weeds and seeds. Beans are only half a green crop, as the plant carries seeds in the year of cultivation, and does not comply with the provision that, in alternate cropping, a seed-bearing crop must be followed by another plant which does not perfect seeds in that year. The smothering effect of the crop is not complete, as the stems are upright and the leaves die from the root upwards. Still the shade of a close crop lodges moisture and excludes drought, the intervals of the drills are pulverised, weeds are destroyed, and, the soil being perforated and divided by the tap-root, the ground derives a rich and lasting benefit from these conjoined sources of effect. Beans, in a rotation of cropping, defer the process of fallowing, but do not, in any case, supersede it. The best drilled husbandry, with dung, makes preparation for wheat, which is called the scourge-crop, as it immediately precedes the fallowing of the land, which is scourged by cropping before being replenished. The fact of wheat thriving so richly after beans caused an examination of the water in which beans had been steeped to exude the fecal matter, and in it wheat was found to grow well; and the supposition was made that plants of a different kind thrive on the food obtained from the feces of the preceding crop; and that plants exude a fecal matter as animals void the excrements. The natural causes above mentioned may produce the benefit observed to accrue to wheat from a crop of beans, and probably assisted by the exudations of fleshy and thickened roots. Be this as it may, the fact was known long before the theory was dreamed of.

II. PEAS.

The word "pea," of which peas and peasen are the plural, is derived from the Saxon "pipa." It is the Pisum of the Latins, the Piso of the Italians, and the Pois of the French. The word Pisum is deduced from the Greek πισον. De Theis thinks the Celtic "pis" is the common origin of the word in all languages.

The pea plant belongs to the class and order "Diadelphia decandria" of Linnæus, and to the natural order "Leguminosæ" of Jussieu.

Generic characters: calyx—perianthium, one-leaved, five-cleft, acute, permanent, the two upper segments shorter; corolla papilionaceous; standard very broad, obcordate, reflex, emarginate, with a point; wings two, roundish, converging, shorter than the standard; keel compressed, semilinear, shorter than the wings; stamina—filaments diadelphous, one simple, superior, flat, awl-shaped and trine, awl-shaped below the middle, united into a cylinder which is cloven at top; antheræ roundish; pistillum—germen oblong, compressed; style ascending, triangular, membranaceous, keeled, with the sides bent outwards; stigma growing to the upper angle, oblong, villose; pericarpium—legume large, long, roundish, or compressed downwards, with the top acuminate upwards, one-celled, two-valved; seeds several, globular.

Essential character: style triangular, keeled, and downy at the upper side; two upper segments of the calyx broadest; stamens in distinct sets.

Some botanists admit three, others describe five, species of the pea:—1. *Pisum sativum*, or common pea; 2. *Pisum arvense*, or field-pea; 3. *Pisum fulvum*, or tawny-flowered pea; 4. *Pisum maritimum*, or sea-pea; 5. *Pisum ochrus*, or wing-pea. The common cultivated pea has the footstalks cylindrical; stipulas rounded and crenate at the base, stalks bearing several flowers; root annual, slender, fibrous; stems hollow while young, brittle, branched, smooth, weak, climbing by terminating tendrils; leaves abruptly pinnate, composed usually of two pairs of leaflets, which are oval aud smooth; stipula large, surrounding the stem or branch; flowers lateral, two or three together on long peduncles; corolla white, or greenish-white, purple, or variegated; legumes commonly in pairs, about two inches long, of an oblong form, smooth, swelling at the straight sutures where the seeds are fastened, flatted next the other suture, which arches especially towards the end; seeds from five or six to eight or nine, commonly globular, but in some varieties irregular, or approaching to a cubic form, smooth, white, yellow, blue, grey, brown, or greenish, with a small oblong umbilicus. The colour of the whole plant is glaucous, or hoary green, from a white meal which covers it. Linnæus remarked that the leaflets are conduplicate, or doubled together. The pea is a native of the South of Europe, and Dr. Sibthorp found it apparently wild in various parts of Greece. It is sometimes found in China and in Cochin China, but that is not very frequent and may not be indigenous. According to Thunberg, it is cultivated in Japan.

All the varieties of peas may have proceeded from the grey pea of the field, which yet exists in cultivation. The most esteemed varieties are the grey pea, the white or tawny pea, and the Hastings pea, or yellow-marl variety. The last-named sort is early and most productive on good lands and under benign climates; the grey pea is hardy and most enduring in high latitudes; the tawny pea holds a middling position.

Peas delight in deep, warm lands, sandy earths, loamy gravels, and dry, friable clays. The soil must be dry, warm, and deep; the presence of calcareous matter is agreeable, and a grit of that body. A loamy tenacity is necessary that produces the useful cohesion. Wet soils are an utter aversion, whether clays, earths, or gravels, and also thin scorching lands that lack the necessary moisture. A climate to suit peas is precarious as the land to grow the crop; moisture is required, and in considerable abundance, but conferred at certain times and in suitable quantities. Much rain and the want of it are equally hurtful; hence the precarious character of the pea-crop among the cultivated plants of the farm.

Peas seldom form a regular part of any rotation of crops, but are introduced on stubbles to defer the clover to a more distant recurrence, and on grass layers that have failed. The wheat and barley stubbles are deeply ploughed in the early winter; ploughed, grubbed, and scarified in the spring into a smooth, level surface, which is then compressed into ruts to hold the seeds of peas, which grow in rows. On the well-harrowed surface of the winter-furrow the corn-drill sows the peas in rows by means of coulters making ruts in the ground, which receive the seed; or the miniature plough, drawn by one horse, opens drills, on which the seeds, being sown by hand, fall into the ruts, and are covered by a light harrowing. The land being partially wrought in the spring, the seeds are sown in the second or third furrow of shallow-ploughing, which regulates the width of the drills as may be wished. When dung is applied, it is spread on the surface and covered. The wrought land has been drilled into ridglets 27 inches apart, the seeds sown by hand, the drills reversed, and the crop horse and hand-hoed. With narrow drills, from 9 to 18 inches, two hand-hoeings cut the weeds and produce some slight pulverization; but all hoeings are soon stopped by the procumbent stems of the peas falling over the intervals and debarring any intrusion; consequently, no large benefit is conferred on the land or crop by the hoeings of the ground. The season of sowing peas extends over the months of February and March, and the average quantity of seed is three bushels to an acre.

The early period of the year in which the land is wrought for beans and peas prohibits the effectual benefit of cultivation, and subtracts greatly from the purpose: but in the case of beans, the defect is very much remedied by the upright stems permitting the summer working of the intervals, by which the weeds are destroyed and the land pulverized. The procumbent stems of peas fall over the intervals, and shut out any workings whatever; and after that period weeds will rise and perfect the seeds: so that the pea does not afford the necessary requisites for the drill-husbandry, owing to the natural structure of the plant.

Peas require good lands, clear from weeds, and in good heart from previous treatment; it is useless to expect good crops under other circumstances. Farmyard dung is not economically used by its application to peas, as it enlarges the stems and foliage without the corresponding increase of pods. The stubble of deep, warm, earthy soils, on which peas are best grown, is ploughed in the early winter by a deep furrow, and the surface will be much mellowed and pulverized by the action of the weather. On this alluvium the peas are sown in the end of February, and during March in broad-cast by hand at the rate of four bushels an acre, and covered by harrowing, and rolled if the surface be cloddy. Thick sowing is essential in order that a full crop of plants may cover the ground by locking together by the tendrils, and the leaves forming a dense canopy under which all weeds are smothered and killed. The shade lodges moisture, excludes drought, and prevents aridity; the surface of the ground is rendered soft and mellow, and imbibes the fertility which attachs to protection from the waste of exposure; this smothering effect constitutes the value of the pea and the vetch, and to produce it good lands and thick sowing are required. No hoeings are done in this mode of cultivation. The ground is wholly covered with plants, and the few open furrows on such lands will seldom be bare on the sides, and left uncovered; but if blanks occur, and weeds grow, a person with a basket may walk along the furrow, pull and carry away the weeds full grown but not seeded. This performance is seldom necessary, as the crop of plants covers the surface evenly and thickly with leaves woven together. The removal of the crop presents a surface of ground in prime condition for wheat with one furrow of ploughing, being skimmed to remove any roots or weeds, farmyard dung is applied in a moderate dressing, and grass seeds are sown on the preparation that has been effected. This is the "ne plus ultra" of pea farming, a crop of wheat after peas being the legitimate course under which the plant ought to be cultivated; the use of it in thin straggling crops on poor lands of all kinds, affording spaces for raising and maturing weeds, is foul farming, and very reprehensible; the procumbent nature of the plant is not adapted for the drill husbandry, and unless the land be of quality to produce the requisite number of plants to cover the ground, the cultivation of peas is better omitted; in any case, the crop is very precarious; the stems must be scarcely half procumbent, the greater half bearing flowers and seeds; the decay of the under haulm must not ascend the plant and leave the ground bare, but be moderate in extent, and destroy only the under foliage. Peculiar climates and particular seasons are required to produce these effects, under which peas are only produced in the proper abundance.

Gypsum is recommended to be sown over a crop of young peas, and also liming and marling of the ground. The straw in 73 parts of the crop contains 40 per cent. of lime, and peas themselves contain 5 or 6 per cent. of that substance, hence the use of calcareous matters. The acid in gypsum is held in a way that prevents the beneficial development of that body as a manure in any mode of application yet done in this country, and the liming and marling of the land must be applied during the crops previous to the peas being sown. The ground must be prepared for peas by the previous treatment joined with the natural quality of the soil.

The ripeness of the pods of peas on the lower part of the stalks evidences the maturity of the crop; a further ripeness opens the pods, and occasions much loss by bursting and shedding. The reaping is done by hand-sickle, partly cutting and partly pulling the stems from the ground. The crop is then rolled into small heaps, which lie until sufficiently dried, and are frequently turned over, in order to expose the under and upper parts alternately. Ropes are twisted of the pea-haulm, with which the bundles are tied; the handling is more convenient, though the drying is not so ready as when the heaps are loose. The dried crop is built into ricks on staddles, or over a tool-shed, or on the tops of ricks of oats, in order to have a light pressure. The ricks must be thatched without delay, as the rains penetrate the open straw of peas, and the crop must be thoroughly dry in order to prevent any mustiness of the haulm. The grain is easily separated from the straw by flail or machine, and the chaff is very readily blown from the grain, which is then ready for sale or domestic use. The average return of peas from an acre of land is 28 or 30 bushels.

The haulm of peas, when well harvested, is an excellent fodder for horses and cattle, and sheep are very fond of the pods from which the seeds have been removed.

The proportion of straw to grain in peas varies according to the circumstances under which they are grown: the average in air-dry plants was found to be 73 : 27.

100 parts of pea-straw contain—

	Air dry.	Calculated perfectly dry.
Water	12·00	..
Nitrogenous flesh-forming constituents	12·55	14·26
Substances not containing nitrogen, support respiration, and lay on fat:—		
1. Soluble in caustic potash	21·93	24·92
2. Insoluble in ditto	47·52	54·00
Ashes	6·00	6·82
	100·00	100·00

These results show a rich quality in peas for forming flesh that is much beyond the common straws.

Ripe peas, when dry, will contain 12·5 to 19·5 per cent. of water, and these quantities may be the result of variation in different specimens. Peas yield from 2·73 to 3·18 per cent. of a whitish ash.

Average composition of peas:—

	Air dry.	Quite dry.
Legumine	23·40	27·24
Starch	37·00	43·07
Fatty matters	2·00	2·33
Grape sugar	2·00	2·33
Vegetable fibre	10·00	11·64
Pectic acid	4·00	4·65
Gum	5·00	5·82
Inorganic matters (ash)	2·50	2·92
Water	14·10	..
	100·00	100·00

Peas will contain, from this average analysis—

	Air dry.	Quite dry.
Nitrogenized or flesh-forming constituents	23·4	27·24
Substances free from nitrogen, support respiration, and lay on fat:—		
1. Starch, sugar, and fat, &c.	50·00	58·20
2. Vegetable fibre	10·00	11·64
Ash materials for forming bones	2·50	2·92
Water	14·10	..
	100·00	100·00

Average composition of the ash of peas:—

Potash	36·67
Soda	7·32
Lime	5·39
Magnesia	8·62
Oxide of iron	1·00
Phosphoric acid	33·88
Sulphuric acid	4·43
Chloride of sodium	2·17
Silicic acid	0·52
	100·00

Green stems of peas are sometimes used. The stalks contain:—

Water	80·00
Starch	3·40
Woody fibre	10·31
Sugar	4·55
Albumen	0·90
Extractive matter and gum	0·65
Phosphate of lime	0·19
	100·00

The quantity of albumen is very small, and the analysis may be repeated.

Peas must be highly nutritious food, from the nitrogenized principles, and exceed all corns; but a clammy toughness, which adheres to the teeth, renders the meal disagreeable to the human palate, and the binding effects are greater than in a more bulky food. Bread of peameal is difficult of digestion, but mixed with oat and barley meal the use is yet continued with advantage. The meal, roughly made and mixed with barley and oatmeal, is used as food for sheep and cattle along with oilcake or bruised oats. Mixed with the whey and skim-milks of the dairy, there is no better food than peameal for young pigs and for farrowing sows, as the mixture very much promotes the milking propensity in the sow and is laxative for the pigs. When pigs are weaned, it forms a most proper food for them; it is also given to bacon hogs, and, notwithstanding the supposed loss when peas are given unbroken, the belief yet obtains that in the last month of fattening the grain is most useful in that state for the purpose of giving a firm consistence to the bacon. It has been proposed to malt the seeds for this purpose and to kiln-dry them slightly, in order to diminish the flatulent property.

Legumine is a characteristic constituent of peas, analogous to gluten in wheat, and, like it, containing about 16 per cent. of nitrogen, is always present, dissolves in cold water, and is separated by dilute acetic acid. Its presence is discovered by digesting meal in water, adding vinegar to the clear liquid, when a curdy precipitate will appear, resembling the casein of milk.

Peas suffer much from insects: in wet seasons the snake millipedes attack the seeds, and on peeping above the ground they are swept away by weevils; when in flower, the aphides, or green dolphin, smother them, probably causing the mildew; the maggots of little flies live in the pods, and others mine the leaves; the caterpillars of a moth live in the pods on the green peas; and the seeds contain the larvæ of a beetle, which eats the farina, and undergoes its transformation so silently that the lightness of the pea only discovers its presence. Bush-harrowing the land, with the dew on the plant, may banish the weevils, which dislike the earths; and also hoeings, lime, soot, wood-ashes are usefully sown over the plants when the animals and the crop are young. Seed peas two years old will banish the beetle, as the animal will then be gone.

White peas are grown in many places for the purpose of making soups, and split peas are easily dissolved into a semifluid state and command a high price; they are good boilers, and easily run into a semifluid or jellied condition. Peas are termed good or bad boilers according to the facility or difficulty of dissolving into a semifluid state, which was supposed to depend on the quantity contained in the seeds of sulphuric acid and calcareous matters; but recent investigations have discovered equal quantities of these matters in good and bad boiling peas, and the statements that have been made on the supposed causes of difference have been so very contradictory as to forbid any reliance to be placed on the assumptions or results. With the discovery of similar constituents in quantity and quality in good and bad boiling peas, the inherent property must be reckoned an occult quality, that is most strictly permanent, and little or nothing modified by any circumstances that have yet happened in the production of the article. The boiling or solubility of peas is much assisted by adding to the water a teaspoonful of sub-carbonate of soda.

V.—*On the Culture of the Pea and Bean.* By WILLIAM E. CROTHERS, Belfast.

PRIZE ESSAY.

I. THE PEA.—(*Pisum*, Lat.)

Class, DIADELPHIA; order, DECANDRIA (*Lin.*), LEGUMINOSÆ (*Juss.*)

THE pea is one of the most nutritious of those plants commonly known as leguminous, and has been cultivated in this and other countries from time immemorial. Scientific men are not agreed as to its native locality; it is supposed, however, to have been originally indigenous in the south of Europe. It is an annual, flowering in June and September, and attains the *average* length of three and a half or four feet in the stalk when fully grown. Its botanical characteristics are thus described by Linnæus:—Calyx, with foliaceous segments; the two superior ones shortest. Vexillum, ample, reflexed. Style, compressed; carinated, villous above. Legume, oblong; rather compressed, but not winged. Seeds, globose; numerous, with a roundish hylum. Annual herb, with abruptly pinnate, cirrihiferous leaves, having three pairs of leaflets and large foliaceous stipulas.

The chief varieties of peas in general use are—the *Early Frame*, the *Charlton* (including the *early* and the *common*), the *Marrowfat* (including the *dwarf*, the *tall*, and the *green*), the *Hotspur* (including the *early* and the *Reading*), *Knight's Wrinkled* or *Marrow*, *Knight's Imperial Green*, the *Spanish Moratto*, *Leadman's Dwarf*, *Spanish Dwarf*, *Knight's Dwarf*, *Dwarf Green Mammoth*, *Bishop's Dwarf*, *Bishop's new long-podded*, *the Early Emperor*, *Prussian Blue*, the *Blue Imperial*, the *Glory of England*, *Dwarf Sugar* and *Tall Sugar*, *White*, *Green*, and *Grey Rouncival*, *Early Single-blossomed*, *Early Golden*, the *Victoria Marrow*, *Shilling's Early Grotto;* besides some comparatively new kinds, such as the *Eugene*, *Prince Albert*, *Harrison's Perfection*, *Fairbeard's Champion of England*, *Fairbeard's Surprise*, *British Queen*, the *Scimetar*, the *Woodford* or *Nonsuch*, &c.

For field cultivation, the *Dwarf Blue* and *Green Imperial* are excellent peas; and of white varieties, the *Pearl Early Charlton*, *Golden Hotspur*, and *Suffolk* are reckoned the best. Of *White* peas to be grown for *gathering green*, several sorts of the *Charlton* are good, and also the *Common Suffolk*. The latter is a very fruitful pea, though it does not bear so soon as the *Charlton*. The best *Grey* varieties are the *Early Late* and *Purple Grey*, also the *Horn* and *Marlborough Grey*. The best peas for sowing in autumn for an early crop are the *Frame* pea (the "*Early*" species), the *Charltons*, the *Hotspurs*, and the *Bishop's Dwarf*. The *Frame* pea was so denominated because it was found to be the most suitable for *forcing* (in sheltered situations, and under the protection of fences, &c.), so as to supply the demands of the early London market, and *did not require sticking*. Here it may be observed that those peas which are allowed to grow up upon sticks yield a more abundant crop than any other, for reasons which are evident to all. They grow larger, and the strength of the stalk is not exhausted in climbing. The *Frame* is dwarfish, and never yields so much as the *Charlton*. The different varieties of the *Hotspur* are very good for an early crop. They are very hardy, and ordinarily prolific, and in consequence are sometimes chosen in preference to the *Charlton.* For a *late* crop, to be sown in June or at the end of May, *Knight's New Green Marrow* is considered the best.

. As it may not be generally known that new varieties of peas may be obtained by the *process of impregnation,* we think it advisable to present the following account of Mr. Knight's method, which we quote from Loudon's 'Encyclopædia of Agriculture:'—

> "Observing that farmers who rear cattle improve their progeny by means of crossing the breed, Knight argues from analogy that the same improvement might be introduced into vegetables. His principal object was that of procuring new and improved varieties of the apple and pear to supply the place of such as had become diseased and unproductive. But as the necessary slowness of all experiments of the kind with regard to the fruit in question did not keep pace with the ardour of his desire to obtain information on the subject, he was induced to institute some tentative experiments upon the common pea—a plant well suited to his purpose, both from its quickness of growth and from the many varieties in form, size, and colour which it afforded. In 1787 a degenerate sort of pea was growing in his garden which had not recovered its former vigour even when removed to a better soil. Being thus a good subject of experiment, the male organs of a dozen of its immature blossoms were destroyed, and the female organs left entire. When the blossoms had attained their mature state, the pollen of a very large and luxuriant grey pea was introduced into the one half of them, but not into the other half. The pods of both grew equally; but the seeds of the half that were unimpregnated withered away, without having augmented beyond the size to which they had attained before the blossoms expanded. The seeds of the other half were augmented and matured as in the ordinary process of impregnation, and exhibited a perceptible difference from those of other plants of the same variety; perhaps because the external covering of the seed was furnished entirely by the female. But when they were made to vegetate in the succeeding spring, the effect of the experiment was obvious. The plants rose with great luxuriance, indicating in their stem, leaves, and fruit, the influence of this artificial impregnation. The seeds produced were of a dark grey. By impregnating the flowers of this variety with the pollen of others, the colour was again changed, and new varieties obtained superior in every respect to the original on which the experiment was first made, and attaining in some cases to the height of more than twelve feet."—p. 249.

Boiling Peas.—This is a variety chiefly employed in broths, soups, &c., and are commonly bought for use when split, because they are then more subject to the influence of water. The best sorts for this purpose are the *Pearl* and *Suffolk;* and in selecting seed the large kinds should be avoided. Boiling peas are easily distinguished from any other species by their readiness to be reduced into a pulp in boiling water. Under the same influence the common varieties retain their usual rotund form. This facility for boiling is derived from the soil. Calcareous soils, or those lately marled, are not fitted for the production of boiling peas. Stiff or coarse land is also unfavourable, and rarely ever produces a crop adapted for splitting.

It is frequently remarked that peas will grow on almost any soil, but, like many another saying which we are accustomed to hear, it is adulterated. It has much truth in it, and it has much error. Most of the leguminous plants will flourish to a certain extent on any soil you may please to select. But be assured the produce, both as regards abundance and flavour, will depend largely on the judiciousness of your choice. If you devote a patch of ground to the cultivation of this crop which is of a moist, weak, or stagnant nature, you will reap an unhealthy, sickly, and insipid harvest; but, on the other hand, if you sow your seed on a soil light, yet rich, and bestow an equal share of attention as in the former case, your labour will be fully recompensed. For the Early sorts of peas a dry soil is preferable, and, if not naturally dry, you might mix a small quantity of sand with it. In general sandy loams and calcareous soils are the best. These are the most approved, and certainly the most congenial or "kindly," if we may use the expression. Should your soil not be of a calcareous character, you might beneficially mix a little lime with your manure, and in addition scatter a little guano over it. If the soil be poor, the drill should be made deep, and richly manured with a healthy compost. If it be heavy, a reverse process should be pursued, so that the seed may not rot. A rich, strong soil is best for lofty growers.

When the soil is very rich, peas require little or no *manuring*. When it is necessary to manure, a light, healthy, compost is the best to apply,—such as is recommended by Mr. Doyle, in his 'Kitchen Garden' (subj. Composts):—

"As early in the month of November as leaves of trees can be collected, let them be brought in considerable quantity into a close place and dressed up there in the form of a hotbed. Let this be well saturated with the drainings from the dungheap, with suds from the washhouse, and with urine from the stable and cowhouse, where this latter article can be procured. Let this bed or heap be covered and lined with fresh stable-dung to make it heat. When the heat has sufficiently subsided, let the leaves be uncovered and turned over to mix the dry and the wet well together, and, if more moisture be required, let them have it of the same description; and repeat the process till all be reduced to fine mould. This will be ready for use in two months from the time of collecting the leaves; and, to prevent any waste of the liquid recommended, a layer of maiden earth, of two feet thick, should be made the substratum, which would receive any of the valuable liquid that would otherwise run to waste. Leaves of slow decomposition should be avoided, as of the oak and sweet chesnut, which, however, are the best for retaining heat in hotbeds and pits. Leaves of the fir tribe should also be avoided, but those of sycamore, elm, alder, maple, and all the soft kinds are best suited to this speedy process. This compost is pregnant with the ingredients which form the best food for plants. It should be kept dry, in an airy place, and ridged up, so that the rain cannot wash out the salts with which it abounds."

Guano has been found to be very beneficial to peas. Among many recorded testimonies to its value as a manure, which from time to time have appeared in our agricultural journals, we have selected the following:—

"The kind on which I experimented," says the writer, "were Prince Albert, Shilling's Early Grotto (a dwarf pea), Blue Imperial, and Marrowfat. The method I adopted with all was to draw a deep trench with a hoe, to strew guano in the trench, mix it up with the soil; over this put about one inch and a half of earth, then sow the seed and cover up. In this way I calculated that the young sprouts of the seed, both root and embryo, could not be injured by coming into immediate contact with the guano, and that when the roots were strong enough to bear it they would find the guano in that state of decomposition best suited for them. The quantity used was about three pints of Ichaboe guano to a quart of seed,—sown, however, much thicker than is customary here. It will be observed that in this case the natural moisture of the soil at the depth at which the guano was placed was sufficient to bring it to a proper state of solution, and rendered the necessity of immediate rain not of so much consequence. When rain did come it was beautiful to see the luxuriance resulting, and I felt persuaded that none of the virtue of the guano had escaped at the surface. The produce of the first three kinds of pea was five full pecks to the quart of seed gathered for next year. From the Marrowfats I obtained only four pecks and a half, and no seed. The growth of all was extremely luxuriant. The Marrowfats were six and a half feet high; the stems from one to one and a quarter inch in circumference. On the Blue Imperial almost every flower bore fruit. On a stem thirteen inches high there were twenty-two pods. This was all uncommon; and such was the specimen I exhibited this year at the room of the Massachusetts Horticultural Society. Many pods of the crop contained nine or ten peas: these would be valuable for seed. I also exhibited very luxuriant specimens of Shilling's Early Grotto in the same hall. The joints, or distance from leaf to leaf, was very much shortened—an effect of guano which has been remarked on its application to fruit trees."

The first or earliest crop of peas is put in about the end of October or beginning of November, and, if carefully protected and transplanted, it will ripen about the end of May. At this time (October) the peas are generally sown in southerly situations, so as to have the full benefit of the sun's rays during the winter, and to be protected from the cold north winds. The next sowing for an early crop takes place in December, so that, if the former one be destroyed by the severity of the weather, the latter may have a chance of succeeding: and the difference of the harvesting period will not be more than a fortnight; sometimes it is not so much. Another sowing may be judiciously made at the end of December or beginning of January, in an open place, if the weather be at all favourable. Then all the "main" crops should be put in from February till April, inclusive. A large crop should not be sown, lest a wet summer should cause it to miscarry. From February till April three sowings may be made in two months, or one every three weeks.

In summer, however, the *quantity* should be reduced. It is frequently observed that, after all, a crop sown in February is not a week later than one sown in November, and oftentimes it is known to ripen as soon. The best seeds for a late crop are the *Hotspurs* and *Knight's New Green Marrow.* These, if sown in June, generally produce fruit at Michaelmas. It is not considered prudent to sow any peas after the first week in July, as they bear very scantily even when there is no miscarriage with the crop. The *purple-flowered pea* is perhaps the only exception. These may be sown in July and August, or so late as the first week in September, if sown in a warm, sheltered situation, and in a soil impregnated with sandy ingredients. Soak the peas in warm milk before sowing, and let the drills be well watered before covering up. It is best to sow them towards the evening, so that the heat of the atmosphere or the influence of the sun's rays will not cause the moisture to evaporate before they are all deposited. If the autumn be peculiarly dry, watering will be necessary.* If this is regularly done, and the seed put in at a greater depth than usual, the peas will grow vigorously, and resist mildew. With regard to *Early crops*, it is best to have them well covered, and sown in such a manner as will facilitate the process of transplanting when the season arrives. The shelter of a wall, or shade of wirework or fences, should be sought. Some have found that *spruce branches* stuck in the ground along the north side of every row, and made to incline a little forward over the plants, afford a good protection from severe weather. During the night they should be covered with either glass shades, matting of wheat haulm, or other material. These should be removed, however, in the morning, when the sun shines. Another method of managing an early crop is by sowing the seed in exposed situations in the months of October or November (protecting at night with the shades), and then, just when the continued frosts of winter set in, let them be transplanted into warm situations with plenty of their former earth around them, and pursue the same course afterwards as with those sown from the first in sheltered spots. This latter mode enables them better to endure the rigour of the winter, and renders them more susceptible of the genial influences of spring, which of course will hasten their fructification. Field peas should be sown early in the year, so that a turnip crop may be secured before the season is past.

The experience of most farmers testifies to the fact that it is injudicious to sow peas on a soil lately manured. If sown on a compost, the chief constituent of which is fresh dung, they frequently "run to haulm." Previous to sowing let the soil be well dug if intended for a garden crop, and ploughed for a field. When the earth is well turned up, if it be of a heavy nature the drill should not be made deep, because, as we have before said, the seed would in such a case be liable to rot. On the other hand, if poor, make the drills rather deep, and add a light compost, on which let the peas be laid down. Should the ground be uneven, level it, and then draw the earth *lightly* over the peas so as to facilitate the process of irrigation. In field cultivation, if the soil be not in good order, it would be well to give it two ploughings,—the first for the purpose of *clearing*, after which the harrow might be beneficially drawn over it; the second for the making of the rows. Should it be in good condition, however, this will be unnecessary, the machine will make the drills, or else the soil can be "ribbed." The inhabitants of Norfolk and Suffolk and the adjoining counties frequently deposit their seed in clover leys: one ploughing is then generally found to be sufficient; but after a crop of corn two are necessary—one in autumn (to clear away the stubble), the other early in spring.

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* See Doyle's 'Kitchen Garden.'

When the soil is prepared, the seed should be sown in drills about one inch and a half in depth, and distant from each other about three or four feet. Should the seeds be of the larger kinds, the drills must be made about two inches deep, and sometimes four, five, or six feet asunder. If peas are intended to grow without sticking, they may, of course, be sown in less space. Then, as to the distance between one pea and another *along the drills*, it will be seen at once to vary with the size and season of each. The *Frame* is generally sown in the ratio of three to one inch; *Hotspurs*, *Charltons*, and *Marrowfats*, two in one inch; *Prussian Blues* and other middle sizes will require two inches for three peas; *Knight's Marrowfat* one in every inch; then the larger sorts are sown in distances of one inch and a half; the *Patagonian* needs two inches for one pea. In gardens the seed is for the most part put in by the hand. There are, however, many simple contrivances, such as dibbling-machines, &c., which, though they may equalise the distances, do not on the whole expedite the work so much as is imagined. In field crops the *broadcast system* is still common, and adhered to by many, though we believe the row culture to be the best plan. Good farmers sow their seed in rows on every second or third furrow of the plough. The back of the furrow is considered the proper place for deposition. Many farmers in the West of England, we understand, sow in this manner, having sometimes only one, but occasionally two rows of peas on each furrow. The rows should be from one foot and a half to three feet asunder, and the seed should have (in fields) a depth of three to six inches, according, as we have said, to the size and season of the pea. Late summer crops require a greater depth than those which are early.

A pint of the smaller kind of peas in most cases will sow a row of about eighteen or twenty yards; but of the larger varieties and for the later crops about the same quantity will sow a row thirty yards long.

After the peas have been sown for some time, when they begin to shoot forth from half an inch to two or three inches in height in the stem, let the earth be drawn towards the latter, and loosen it with the hoe; at the same time care should be taken to prevent the mould from touching the tops of the shoots, else they will wither. During the entire growth of the pea one of the most essential elements of good cultivation is the judicious and continuous use of the hoe—to keep the soil clean and to root up weeds. As the stems increase in height, supply them with more earth at their extremities. Should the weather be dry in the spring or early summer months, watering will be necessary. Some farmers omit sticking their peas, but assuredly this is improper. If an abundant harvest be desired, peas should always have stakes: branching roots are preferable. When the peas attain the height of eight or ten inches, the process of sticking should commence. Rods three feet long will suffice for the smaller kinds, such as the *Frame* and *Leadman's Dwarf;* four or five feet will be required for the *Charltons* and *Hotspurs* and *Dwarf Marrowfats;* the larger *Marrowfats* and other varieties six or eight feet; *Rouncivals* and *Patagonians* nine or ten feet. The rods should be placed in such a position as will enable them to have the peas attracted towards the sun, and should always be at a greater distance asunder at the top than at the bottom. Just before the peas flower the hoe should be brought into requisition to earth up the soil; and when flowering *has* commenced it frequently proves beneficial to cut off the principal shoots, as this hastens their growth.

Great care should be exercised in the final branch of the cultivation of the pea; so that, if the crop be intended for seed, it should not be mismanaged, or allowed to "run to haulm." A dry period is highly advantageous in harvesting. When peas are grown near large towns for sale in the market they are almost invariably reaped before they are ready—when the pods are small and thin, and the peas unripe. They should be "taken" when full and roundish in the pod, and green and tender. None, however, should be permitted to remain on the stalks longer than is proper, or else they will shed and go to loss; and a little carelessness often results in serious damage in the management of a pea crop. When they become too ripe they wither, and assume a brownish appearance in the pod, which last also open spontaneously. When designed for *seed* it is right to let them remain till they appear thus; they are then fit to be hooked and prepared for threshing. Afterwards they can be cleaned and stored. Before they are stored they should be minutely examined and sifted, so that any degenerate sorts may be removed, and future evil prevented. "Last gleanings of a crop seldom afford good seed." On good ground, and grown with good seed, peas ordinarily yield from three and a half to four quarters per acre. From forty to fifty sacks per acre (of three bushels each) of peas *in the pod* are yielded in Dartford in Kent, and from about fifteen to thirty *bushels of seed* per acre; the amount varying according to the soil, temperature of the season, and mode of cultivation.

The *diseases of peas* arise chiefly from the attacks of slugs and mice, mildew, and the like; and with these a continual warfare must be waged, especially when the shoots are young and tender. Occasionally, when the peas are in blossom, a species of fly attacks the *leaves* and *flowers*, whilst the *pods* suffer much from the effects of worms. These latter evils can only be obviated by care and attention, not only in selecting the seed, but also in choosing a locality for sowing. No damp soils should be selected, or soils situated near a deep drain-course. The neighbourhood of shrubberies or trees should also be avoided, as slugs generally find their withered leaves to be an agreeable shelter and habitation. Hence it has been recommended by some to strew decaying foliage, tufts of wheat and grass, celery-tops, &c., over *beaten* spots which they are known to frequent; for when they return from their morning depredations they eagerly take advantage of the shade of these clumps, and then, if a little quicklime be scattered over the heaps, they will almost all be destroyed. Soot is a good remedy, and has the additional worth of being a good manure. Salt is efficacious if prudently used, but when recklessly scattered it injures the growth of the peas. It is also a good antidote against the attacks of the louse:—

> "In 1844," says a correspondent in the 'Gardener's Chronicle,' p. 163, vol. for 1847, "I sowed one hundred rods of salts, thirteen rods of which were of Flack's Imperial Peas. The peas came up and thrived. Master louse attacked the peas very strongly that season, especially on my neighbour's field adjoining (about three rods from the said thirteen rods). His were of the very same sort, and were so sharply attacked that they were good for nothing, only for their straw. The louse was hardly seen on mine, and I had of the said thirteen rods six bushels of peas dressed clean."

As to *mice*, if a little care be exercised when planting the seed, it will not afterwards be likely to be destroyed. The drills should be well covered, and have a regular, even surface. When this is effected, mice are unable to detect the position of the seed. The following remedy has been suggested by another correspondent of the same Journal:—

> "In order to keep mice from beans and peas I sifted some coal ashes with a fine garden-riddle, and covered my beans about an inch in depth with the ashes. The beans were never afterwards touched by mice. I supplied the same *remedy to peas, and I find it to answer equally well with them.* My peas and beans are coming up finely, and without rust or disease of any kind." —Vol. for 1845, p. 151.

If peas are soaked in *train-oil* just before sowing, it will prove an effectual antidote against mice, and will also encourage their growth.

Some of the uses to which the pea is applied we have already noticed, and in conclusion we may observe that, common as it is now amongst us as a kitchen garden fruit, it was not so about three centuries ago. Its properties were not so well known, nor were the facilities for its cultivation so accessible to all. Consequently we need not be astonished when it is recorded by Fuller that in Queen Elizabeth's age "they were fit dainties for ladies, they came so far (for they were then imported from Holland) and cost so dear."

II. THE BEAN.—(*Vicia Faba*, Lat.)

Class, DIADELPHIA; order, DECANDRIA (*Lin.*), LEGUMINOSÆ (*Juss.*).

The bean is another variety of the same genus as the pea, and has, like it, been cultivated from the earliest ages. It has not, however, so much nutritive matter within it: indeed, one of its peculiar characteristics, that of inducing flatulency, was so prominent in the varieties cultivated by the ancients, that Hippocrates, the celebrated Grecian physician, prohibited the people from using it. Nor was this dictum confined to his own nation, for other countries, following his prescription, adopted his regimen. The Greeks made use of beans in declaring the votes of the people at any election; and in undecided cases of prisoners, when a lot was cast, the white bean coming out first indicated absolution, the black one condemnation. The bean is an annual plant, attaining the average length of about three feet. The common variety may be thus described:—Thick angular stem; leaves divided, without tendrils; the flowers white, with a black spot mostly in the wing; pods thick and long, lined with a downy material, and containing the ovate flat seeds. The botanical features in technical language is thus given by Linnæus:—*Bean. Diad*, Decand. The character of *Fava* is nearly the same as that of *Vicia*, but differs principally in the great size of the legume, which is cariaceous, and rather tumid;

seeds oblong, not round; and in the hylum being terminal, not lateral. Erect plant, with abruptly pinnate leaves, with or without a simple tendril.

The principal varieties of the *Bean* are the *Mazagan*, the *Windsor*, the *Lisbon*, the *Large Long Pod*, the *White Blossom*, the *Sandwich*, the *Joker*, the *Hanydown*, the *Genoa*, and some new varieties, such as *Johnson's Wonderful*, *Dwarf French*, &c. &c. New varieties may be obtained by careful management in selection or by the process of *impregnation*, to which we have already alluded in the culture of the pea (see Pea). The *Mazagan* is small, hardy, and well-flavoured. It is so called from a Portuguese settlement which lies to the north of Morocco, near the Straits of Gibraltar, on the coast of Africa. The *Lisbon* is an early bean like the *Mazagan*, very fruitful, and of a pleasing taste. The *Long Pod* is, perhaps, the greatest bearer of all, and belongs to the larger but late class. It grows about three feet high, and is hardy, and of easy cultivation. The Spanish bean, especially the variety known as the *Broad Spanish*, likewise excels in fruitfulness, as does also the *Sandwich*, which is a large but not very delicate bean. The *White Blossom* is good and hardy, but liable to degenerate. It is a late kind, being generally sown about the end of May or beginning of June. It is so called because the usual black spot does not appear on the blossom. None of the larger sorts are so much admired as the common *Windsor*, which has been long celebrated for its richness. Those *best adapted for an early crop*, to be sown in autumn, about the end of October or beginning of November, are the *Mazagan* and the *Lisbon*. And in procuring seed, purchasers should endeavour to get those which are latest imported from Lisbon, and not the product of a crop grown in Great Britain. Those brought directly from Lisbon are ordinarily more fruitful and produce an earlier crop than seed saved at home, for in our climate and soil the *Mazagan* especially soon degenerates. For sowing in the field the best kinds are the *Horn* and *Tick Bean*. The former is an excellent bean, but not so hardy as the latter. Occasionally the *Mazagan*, the *Heligoland*, and *Long Pod*, produce large and abundant crops. In Kent and other places some garden beans are cultivated in fields, such as the *Windsor*, *Joker*, *Sandwich*, &c. One peculiarity may be noticed in regard to the *Green Genoa Bean*. It is this: if permitted to be perfectly ripe before they are pulled, and then be well dried, they may be kept in that green condition for winter use; and, "if steeped for some days before they are wanted, they will become tender and retain their colour and summer flavour." *

Beans will succeed best on a strong, and rather moist than dry soil. Coolness being desirable, it will be found that clayey and chalky loams impregnated with a calcareous element will be most favourable to their cultivation. Immediately before sowing, it has often proved advantageous to insert a strong clean compost between the drills, especially for the early sorts and the *Windsor Bean.* Besides, this will improve the soil for after crops.

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* See Doyle in 'Kitchen Garden.' (Subj. Beans.)

An artificial manure for beans suggested by Mr. Huxtable contained ten bushels of lime, two cwt. of superphosphate of lime, and five bushels of salt and ashes. If your land has been limed, you had better depend upon some nitrogenous substance for a top-dressing. Nothing is better than guano—say three cwt. per acre. If you have not got it, apply twenty or thirty bushels of soot, and three or four bushels of salt.* (For further information concerning manures, see Peas in this Essay.)

The first crop of beans should be sown about the end of October, or in the course of November, in a spot which is sheltered, and yet open to the full influence of the sun. The *Mazagan* and *Lisbon* are the best for an early crop. The next sowing may take place in December or January, and if the weather be mild a more exposed place may then be selected. The *Early Long Pod* and *Small Lisbon* are suitable beans for this crop. The *Large Long Pod* and *Broad Spanish* may be judiciously sown in February, as also the *Sword*, *Long Pod*, *Joker*, and *Sandwich.* The "*main*" crops should be sown in March and April, consisting of the *Windsor* and other varieties just mentioned. Beans should rarely be sown in the field later than March, because our climate, being variable, they might otherwise prove a very precarious crop. March is the general season, though in Scotland, especially in the northern districts, the *early kinds* are only then beginning to be sown. In May and June the later varieties may be put in, such as the *White Blossom*, &c. In June and July the last crops are sown, consisting of the smaller and early kinds, such as the *Mazagan*, &c., as these bear the severity of the autumn better than any others, their constitution being hardy. In the management of the early crops let it be observed that, as beans are accelerated in growth by transplanting, it is advisable to sow them thickly in the first crop in a bed of light earth, with a frame or fence for shelter (see Peas, in this Essay). Then in February or March transplant, when the weather is more settled and mild, but still under the protection of a shelter, and let the earth be well hoed up around them. By careful culture they will thus be made very productive.

As the greater part of our remarks on the *preparation of the soil* in reference to peas is equally applicable to beans, we need not occupy space by reiteration, but only notice those points of culture which the former does not possess in common with the latter. In garden cultivation the land should be carefully dug for beans, though it is not well to have it in too pulverised a state. The drills are to be then made in the usual way. In field cultivation, however, the land must always be well ploughed, and, if at all possible, let it be done twice. If a crop of beans is intended to succeed a crop of wheat, a healthy manure should be applied. The best time to lay down the manure is just before sowing. It is recommended by many to deposit the manure on the top of the wheat stubble before the first or winter ploughing is given. This will, of course, render the after culture less troublesome. Wheat will succeed a crop of beans well if the latter have been well manured. Beans should never be sown on turnip or sandy soils.

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* See 'Gard. Chron.' for 1854, page 93.

As in the cultivation of the pea, the *broadcast system* can likewise still boast of supporters in the culture of the bean (in fact, till lately it was the general custom in Great Britain to sow them in that manner), though sowing in rows is assuredly better for the soil. When the drills are made (we speak now of garden cultivation) the seed should be sown in rows about two feet or two feet and a half asunder, one inch and a half in depth, and two or three inches apart in the rows. Beans should, as we have already said, be sown more thickly when deposited in winter for an early crop, and should then be placed in a warm situation. The larger sort should be sown three feet asunder in the rows, two and a half or three inches deep, and three and a half or four inches distant in the rows. A "*dibble*" is generally employed in sowing beans, and in using it the sower should ascertain that it is large enough for the size of the seed, so that it may reach the bottom of the hole made in the soil at once, after which the earth should be carefully put in. Beans may be sown without a dibble by the help of the hoe if the drills are properly made. This mode is best adapted for the smaller varieties. In the *field* they are mostly drilled or put in after the plough in every second or third furrow (see Peas). The manual operation is then performed by the dibble, or else by the drill-machine and seed depositor. A pint of beans, if intended for an early crop, will sow a row eighty feet long; in the "main" or later crops a pint will sow about three times that amount.

The "after culture" of beans corresponds to that of peas. As the plants rise use the hoe well and frequently; and, since "ill weeds grow apace," let the gardener prove by his alertness that he is as vigilant in all his actions as they are precipitate in their growth. It is an important matter to have the earth loose and porous around the stems of beans, especially when three or four inches high. Watering should be carefully attended to if necessary. The method for accelerating the growth of peas by cutting off some of the shoots when in flower is applicable to beans. In field cultivation the harrow may be used about a week or so after the seed has been sown in the rows, and then the horse-hoe should be employed to remove the weeds.

As soon as the beans become dry and hard in the pods, either pull up the stalks, mow them, or cut down with a sickle; then expose them to the sun, and, if field beans, they may be tied in sheaves like flax, with straw. When they are sufficiently hardened by exposure to the sun they are ready for threshing. In cutting them down care should be taken to cut the stalks close at the extremities, for the pods are generally larger and fuller there than on any other part of the stem. On good ground, and grown with good seed, beans generally yield from fifteen to thirty, or sometimes thirty-five bushels per acre. In wet seasons the amount is less.

The chief *diseases* of beans are the honey-dew, the mildew, the "rust," and those arising from the attacks of slugs and mice. Against these we may specify the same antidotes as those that are applied to peas (see Peas, in this Essay—subj. Diseases). With regard to the ravages of insects, the best and safest remedy is to cut off the part infected (which is generally found to be the top of the stalk) with a scythe when they are found to settle thereon. This expedient is so well known that it may perhaps be considered unnecessary to quote the following evidence as corroborative:—

> "Observing," says the writer, "that the aphides gradually descended down the stem as they multiplied, infecting the whole plant, and destroying everything if left to their own inventions, I thought I might be able to arrest their progress by topping the beans below the point at which they were covered with insects. I ordered this to be done, and found that the pests died on the ground as the top shrivelled up, doing no further mischief. . . . A man with a sickle could in two days top an acre of beans at the cost of 4*s*., saving as many pounds."—*Garden Chron.*, p. 611.

The nutritive qualities of the bean have long rendered it an esteemed legume, not only as an eatable for man, but as a wholesome diet for horses and other animals. To the former it is more nutritious than oats, though the latter is certainly more easy of digestion. When pigs are fed on beans, they make rather superior bacon.

The value of the bean and pea, in common with other leguminous plants, will be further appreciated when we consider that the source of their nutriment is derived principally from those ingredients which are closely allied to animal substances; and, further, that they not only exhaust the soil less than any other vegetable, but in fact prove beneficial to it by stagnating carbonic acid gas on the surface.

VI.—*Farmyard Manure, considered Chemically and Practically.*

By Edward Spender, of Mannamead, Plymouth, and S. W. P. Isaac, of 13, Northgate-street, Bath.

Prize Essay.

In all sciences a new principle has to fight its way before it can gain general recognition. How long the fight is to continue must depend upon the number and sturdiness of the opponents. In any question that affects agriculture the struggle is long and obstinate, for there is a stout phalanx of foes whom habit has wedded to old facts, and whom it has therefore rendered proportionably slow to receive new ideas; and thus it happens that so thoroughly a practical proposition as that the manure-heap is the farmer's storehouse of riches—that he who wastes the one is assuredly squandering the other—even this has not yet won its place among the postulates which no one will care to deny, much less among the axioms that cannot be denied. True it is that the younger generation of agriculturists, who do not conceive science and practice to be utterly at variance, and even farmers who have been walking over their fields ever since the century began, will admit that on the right preservation and application of manures their prosperity depends, yet, as a matter of fact, do we not see in numberless cases the manure either lying about the farm exposed to sun and rain, or, if it be collected into a heap, each shower carries away its virtues to the neighbouring horse-pond? Were Gulliver to visit our country at the present time, he would deem it inhabited by a colony of Laputans, who had borne with them the wild vagaries of the Academy of Lagado. We should be found intent on "reducing excrements to their original food." Perhaps the sarcastic traveller might think our means and appliances less objectionable than those made use of in the mother country, but the object would be the same—to bring a clean thing out of an unclean; to turn offal into food.

We have alluded to the slow progress made amongst agriculturists by scientific principles. It will not be supposed that we imagine the farmers of former generations to have followed their profession without certain fixed data. It did not require any very advanced knowledge to find that out of nothing nothing can come, or that what we take from the ground we must give back to the ground—a principle which we find allegorised in mediæval sermons. Yet it cannot be denied that the farmer of the last century made frequent mistakes and injured the land, because he did not know what the land required.

The chemist informs us of two facts on which the whole theory and practice of agriculture are founded:—

1st. What are the constituents of the soil.

2nd. What are the constituents of manure.

In the following remarks we have confined our attention to one special, viz. Farmyard Manure. This Dr. Voelcker styles a universal and perfect manure, since it contains all the elements which are to be found in the soil. These elements are divided into the two great classes of Organic and Inorganic, which are again subdivided into Soluble and Insoluble.

By organic we include those materials which are supplied by the atmosphere, and which, when the manure is burnt, are restored to the atmosphere: such are oxygen, hydrogen, carbon, nitrogen. By inorganic are intended those ingredients which are derived from the earth, and which, when the manure is consumed, are left upon the earth in the form of ashes.

I. ORGANIC.—It may be stated as a general rule, though subject to some modification, that the value of a manure is proportionate to the amount of nitrogen which it contains. Thus 2¼ lbs. of woollen rags will produce the same beneficial effect, though not so speedily, as 100 lbs. of farmyard manure.

Resulting from this principle we find that vegetable manures are far less valuable than animal. In other words, they contain much less nitrogen, a fact sufficiently attested by the faint odour given off by the former when compared with the latter. *Nitrogen* is conveyed to the plant in rain-water, under the form of carbonate of ammonia ($NH_3\,CO_2$). This is derived from the putrefaction of preceding races of animals and vegetables, and must at all times exist in the atmosphere, though not easily detected until accumulated in rain, which, in passing through the atmosphere, readily conveys it to the soil.

The amount of ammonia thus imparted is well-nigh incredible. Mr. Nesbitt estimates the amount of ammonia contained in the rain-water that descended in the neighbourhood of Paris, and which has recently been experimented on, as equal to a dressing of 2 cwt. of Peruvian guano per acre.

The soil attracts the ammonia from the atmosphere, and the sulphuric acid which, in combination with lime ($CaO\,SO_3$), existed in the ground, unites with it, and forms sulphate of ammonia ($NH_3\,SO_3$).

The *oxygen* and *hydrogen* are conveyed to the ground by the same agency as that which conveys nitrogen, viz. rain.

The *carbon* is supplied from the air, for every time that we expire we breathe out carbonic acid, which is readily absorbed by the plants, and these in their turn purify the atmosphere by giving forth oxygen.

II. INORGANIC.—Among these constituents we find *silica*, an oxide of the element silicon, which occurs pure in quartzose crystals and many sandstones. It is this salt which gives hardness and strength to the straw of cereal crops. If wheat be too frequently repeated on a poor land, the plant will become weak and go down before it is ripe. Silica is found more abundantly in clay than in sandy soils; consequently, in the former wheat crops will succeed in quicker rotation.* Silica enters into combination with other salts, such as alumina and potash, and it is the presence of these in the ground that renders the soil capable of absorbing ammonia. It is, therefore, of no little importance that the silica which has been taken from the soil chiefly by the cereal crops should be restored to the soil. This restoration is effected by means of the straw contained in farmyard manure. The straw has abstracted silica from the soil, and to it we must look for a fresh supply. Hence straw is by no means a merely mechanical vehicle, but is a powerful chemical agent, imparting a constituent important in itself, and still more so as it enables the plant to assimilate the indispensable nitrogen.

Lime is another very valuable salt. It is found in all fertile soils and enters into the composition of every kind of plant. It possesses the power of rendering available insoluble substances. Thus in peaty soils the humus is converted into its constituents carbonic acid and water, while the nitrogen of the atmosphere probably unites with the liberated hydrogen and forms ammonia. Lime acts on mineral matters by setting free the alkalies that are found combined, in an insoluble form, with alumina and silica. They are then rendered soluble and useful. Lime is supplied by the urine of farmyard manure.

Phosphoric acid, inferior only to nitrogen in agricultural value, is found in the soil in combination with the bases lime, potash, soda, &c. These salts likewise are obtained from the urine. Phosphate of lime ($CaO\ PO_5$) is an important element in the growth of live stock; it enters largely into the bones and milk.

Sulphuric Acid (SO_3) is found in combination with the same bases as phosphoric acid, and is artificially supplied to the soil by the same means, viz. the urine.

Magnesia is found in limestone rocks, and resembles lime. It usually exists under the form of carbonate.

The alkalies, *soda* and *potash*, we have already said, are commonly met with in union with sulphuric and phosphoric acids.

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* The assertion in the text and the consequence drawn, if true at all, are only true in a very qualified sense. The power of clay soils to produce wheat more frequently than sandy soils depends on other causes; and after all that has been said about the silica in wheat straw, no one it is believed has yet found that the addition of silica in the form of manure will effectually stiffen wheat. It has been suggested that the stiffness of straw may depend on the general healthiness of the texture of the plant in those parts in which silica does not predominate. The subject requires further investigation.—ED.

The phosphates contained in the urine are soluble; those found in the solid excrements are insoluble.

All these salts are inorganic, and may be either soluble or insoluble. They are the food of the plant, yet in themselves are as useless as undigested food to a man. The plant has no power to appropriate and assimilate these constituents without the aid of the organic elements oxygen, hydrogen, nitrogen, and carbon.

We now come to consider the comparative value of these several materials. We have already stated that the proportion of nitrogen forms a fair test of the value of a manure or of its different ingredients. Let us, therefore, examine farmyard manure as it appears to the eye—that is, not with regard to the carbon, oxygen, ammonia, &c., contained in it, but as consisting of the solid and fluid excrements of various animals. The subjoined table, taken from Johnston's 'Agricultural Chemistry and Geology,' 7th edition, p. 237, represents the weight in pounds which is equivalent to, or would produce the same sensible effects upon the soil as one hundred pounds of farmyard manure.

Farmyard manure	100
Solid excrements of the cow	125
” ” horse	73
Liquid excrements of the cow	91
” ” horse	16
Mixed excrements of the cow	98
” ” horse	54
” ” pig	64

Yet while these figures will pretty accurately represent the respective value of the materials, it should be remembered that no one manure will long be sufficient for the soil, and therefore the continued application of the liquid excrements of the horse, for instance, however rich in fertilising ingredients, will, if used singly, by no means produce such visible results as the large proportion of nitrogen which it contains would indicate.

But it may, nevertheless, be taken as a rule of sufficient certainty, that the quantity of any manure requisite to produce a certain effect is in inverse proportion to the amount of nitrogen present in it: in other words, the quantity decreases as the quality increases.

Nicolai, in his work entitled 'Principles for the Regulation of Estates,' says (see Thaër's 'Principles of Agriculture,' translated by Shaw, London, 1844, vol. i., p. 163):—

"One ox or cow yields 10 loads of dung, for a two-horse wagon.

"One young ox or cow yields 5 loads of dung, for a two-horse wagon.

"One horse fed in the stable yields 15 loads of dung, for a two-horse wagon.

"One horse turned out to grass yields 7½ loads of dung, for a two-horse wagon."

He allows 20 of these loads of the dung of cattle per acre, 18 of horse-dung, and 25 of the mixed manure obtained from the farmyard.

Consequently, an ox manures ½ an acre, a young ox or cow ¼ of an acre, a horse fed in the stable 5-6ths of an acre.

Thus we find the practical agriculturist arriving at a very similar result to that which the chemist obtains from scientific experiment. Too much reliance should not be placed on these comparative tables, since very much depends on the kind of food which has been given to the various animals. For instance, Thaër remarks, "A horse fed for the most part on corn will yield almost, if not quite, as much dung as one that consumes twice that weight of hay only."

The effect of Turning and Compression on Dung-heaps.

If we wish a fire to burn briskly, we stir it, and thus admit the oxygen of the air. Now the same rule holds good with fermentation: if we wish such process to be rapid, then turn the manure, and freely admit oxygen from the air; if, on the contrary, slowly, then compress the heap and exclude the air. As fermentation proceeds, valuable volatile gases are formed and given off. The loss the manure thus sustains from rapid fermentation will be discussed under the other heads of this paper. We will here merely remark that where the fermentation is slow (as is the case when manure is buried in the ground, or properly compressed in the heap), the valuable ammonia and other products are retained. As a general rule the practice of turning wastes, whilst that of compression preserves, the valuable qualities of the manure.

The best means of preventing Waste and of using the Drainings of Dung-heaps.

In that very witty yet very practical work, the 'Chronicles of a Clay Farm,' the writer alludes to his neighbour Drychaff's dung-cart, as that "creaking hearse that is carrying to the field the dead body whose spirit has departed." There are, unfortunately, too many neighbour Drychaffs, who unconsciously waste, either in the process of fermentation or in the drainings of their dung-heaps, a large proportion of the most valuable constituents of their manure.

As the process of fermentation proceeds, volatile ammonia, the most important ingredient of farmyard manure, is (unless prevented) given off, and the quality of the manure deteriorated. A still greater loss arises from the rain washing from the heap, in the shape of drainings, its soluble matters. Dr. Voelcker, in a lecture delivered at Yeovil (January 9, 1857), stated that in one experiment he found 961 lbs. of dry manure reduced in six months to 689; and in one year to 507 lbs. The soluble organic matter was at first 70 lbs., in the course of six months it became

86 lbs., but exposure to rain reduced it in three months to 50 lbs. From other experiments it appears that 100 cwt. of fresh dung become reduced, when half rotten, to 80 cwt.; when "fat and cheesy," to 60 cwt.; when completely decomposed, to about 45 cwt.: 100 cwt. of fresh dung contains 40 lbs. of nitrogen; during fermentation in the first period 5 lbs., in the second 10 lbs., and in the third 20 lbs. are dissipated in the form of volatile ammonia. From this it appears that dung, when fully decomposed, may be reduced one half in bulk and quality. In theory it would be best to apply the farmyard manure fresh to the land, as the loss of the volatile gases and of the drainings of the heap would be thus prevented.

This, however, in practice can seldom be advantageously done. Before plants can avail themselves of the food contained in manure, it must become decomposed, and this process is slow when the dung is buried in the earth. It is frequently desirable that the manure should be in a fermented state, so as to at once assist the plants, as in the case of root crops. In winter, also, the manure should be carted from the yard to the fields, so as to economise time in the busy season. The farmer is consequently obliged to keep a store of more or less fermented dung, and it is an object with him to conduct this fermentation with the smallest loss of manurial constituents.

On most farms the manure is prepared in manure pits, erected to contain the fresh dung of the stables; but recently the system of allowing the dung to accumulate under the animals has been adopted. This latter plan appears to be the most economical, as the manure is consolidated by the treading of the cattle, air excluded to a certain extent, and fermentation consequently checked. In the box-feeding system the urine also is more easily retained and absorbed; and neither sun, rain, nor wind, which deprive the open manure pit of many of its fertilizing qualities, can exercise any influence.

The following analyses are by Dr. Voelcker (Morton's 'Cyclopedia of Agriculture,' page 345), and show the superiority of box manure to common farmyard kept in the open air. The former it will be seen is richer in ammonia and soluble organic and inorganic matters.

Box Manure contains:		Per Cent.
Water		71·04
Nitrogen equal to ammonia 2·37		1·95
Organic matters removable by water		6·42
Inorganic do., consisting of:		
Phosphoric acid	0·30	4·28
Potash and soda	2·00	

A small quantity of lime and a considerable quantity of silica not determined.

Common Farmyard contains:		Per Cent.
Water		71·00
Nitrogen equal to ammonia 1·70		1·04
Organic matters removable by water		1·82
Inorganic do. do., consisting of:		
Phosphoric acid	0·21	2·78
Potash and soda	80	

A trace of lime and a considerable quantity of silica not determined.

Where it is necessary to keep the manure in heaps care should be taken to form them in such a manner as to prevent fermentation. For this reason the heap should be pressed together as much as possible, and coated with earth. Mr. Stephens, in his 'Book of the Farm,' recommends that, when the heaps are formed in the field, the horses and carts should be driven over them to consolidate the manure. Mr. Lawrence of Cirencester gives the result of his experience as follows:—

"Some three or more spots are selected according to the size of the farm, in convenient positions for access to the land under tillage, and by the side of the farm roads. The sites fixed on are then excavated about 2 feet under the surrounding surface. On the bottom are laid some 3 or 4 inches of earth to absorb any moisture, on which the manure is emptied from the carts. This is evenly spread and well trodden as the heap is forming. As soon as this is about a foot above the ground-level, to allow for sinking, the heap is gradually gathered in, until it is completed in the form of an ordinary steep roof, slightly rounded at the top by the final treading. In the course of building this up, about a bushel of salt to two cartloads of dung is sprinkled amongst it. The base laid out at any one time should not exceed that required by the manure ready for the complete formation of the heap as far as it goes. Within a day or two after such portion is built up and has settled into shape, a thin coat of earth in a moist state is plastered entirely over the surface. Under these conditions, decomposition does not take place, in consequence of the exclusion of the air, or at any rate to so limited an extent that the ammonia is absorbed by the earth, for there is not a trace of it perceptible about the heap, although when put together without such covering this is perceptible enough to leeward at 100 yards distance."

Dr. Voelcker (Morton's 'Cyclopedia,' page 345) suggests:—

"that the sides and bottoms of manure-pits should be rendered impermeable to water, either by clay puddling or hydraulic cement. That the bottom of the manure-pit should be in a slightly inclined position, so as to carry the liquid manure and drainings into a manure-tank, which should be sunk close by. The tank should be provided with a pump, so as to return the liquid matters to the heap again in dry weather. The heap should likewise be well trodden."

Mr. Haxton (Morton's 'Cyclopedia of Agriculture,' page 324) says:—

"When heaps are formed, the cart should always be driven on the heap before being emptied; by so doing, the manure is consolidated, the air excluded, and fermentation prevented. In finishing the heap the ends should be raised nearly on a level with the centre, which is done by a little attention on the part of the carter. Those portions unavoidably left low at both ends for the cart to get on and off the heap, can be raised on a level with the rest by backing several cartloads, tilting them up, and throwing up the manure with forks. After this, the whole heap should be covered with earth from the sides 3 or 4 inches thick, which should be well beaten down with the back of a spade. Road-scrapings, when they can be got conveniently, are even better than common soil, as they are in a very minute state of subdivision from the grinding and treading of cartwheels and horses' feet, besides containing considerable quantities of manure dropped on the roads. If these are sufficiently wet to beat into a plaster on the heap, so much the better, as the surface will thereby be more hermetically sealed, both within and without. Sulphuric acid might be profitably sprinkled over the surface, to prevent the escape of ammonia. The sites for these manure-heaps should be as sheltered as possible, to prevent their surface becoming too dry. An excavated site built on three sides with a wall 4 feet high, is decidedly the best means of preserving manure in the fields."

Several artificial fixers for the ammonia have been proposed, as sulphuric acid, gypsum, salt, and charcoal. Of these, however, gypsum and salt do not act precisely as generally supposed. Gypsum is better adapted for fixing the ammonia in liquid than in solid manure; and salt appears to act not as a fixer of ammonia, but as a retarder of decay. We imagine, however, in practice, that no artificial means can be found to supersede the natural and universal fixer, earth, or ashes.

Much has been said of the waste resulting from the drainings of manure heaps, and of the "ever ready receptacle the horse-pond," which, like the famous hole in the Roman Forum, swallows, if not the best blood, at least much of the riches of the country. Many advocates for the box-feeding system stoutly maintain that all manure which is not made under cover very greatly deteriorates. Mr. Haxton goes so far as to advise that the strawyard should be covered in, alleging that the improved character of stock and manure would pay a large interest on such outlay. According to him (Morton's 'Cyclopedia of Agriculture,' page 323), a stall-fed cow voids about 60 lbs. of urine per day, one-third of which is retained by the litter. Consequently, were no provision made for collecting the surplus, the loss in twelve months would amount to 40 × 365 = 6 tons 12 cwt. and 16 lbs., or 1480 gallons, every 5½ of which contain nearly 1 lb. of ammonia. The loss from ammonia alone, calculating this substance at 6*d.* per lb., its recognised value in agriculture, would be 262 lbs., at 6*d.* = 6*l.* 11*s.*, which would purchase 14 cwt. of guano, or one ton of usperphosphate.*

Whether these figures are correct or no, the following extracts from an article by Dr. Voelcker in the same work, page 349, will show the importance of preserving the drainings from dung-heaps:—

> "In wet weather the drainage of manure-heaps amounts to a considerable quantity, and the value of the solid manure is very much diminished if the liquid manure is not returned to the heap at a convenient season. The drainage matters of the dunghill have been carefully examined by Professor Johnston, who has shown that exactly the most valuable constituents of farm-yard manure are contained in these drainings. A specimen obtained from a heap of cowdung exposed to rain, on evaporation to dryness, left about 480

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* Dr. Voelcker, in a recent paper on the subject in the Royal Agricultural Society's Journal, disputes the general belief that much ammonia is lost by volatilization.

grains or an ounce weight of dry solid matter in the imperial gallon. This solid matter consisted of—

	Grains.
Ammonia	9·6
Organic matters	200·8
Inorganic matters (ash)	268·8
	479·2

"The inorganic portion contained—

	Grains.
Alkaline salts	207·8
Phosphate of lime and magnesia, with a little phosphate of iron	25·1
Carbonate of lime	18·2
Carbonate of magnesia and loss	4·3
Silica and a little alumina	15·4

This specimen was dark-coloured, and contained only what rain-water is capable of washing out of cowdung.

"Another specimen of liquid manure, analysed by Professor Johnston, consisted of the drainings of farmyard dung when watered with cows' urine. An imperial gallon on evaporation left 617½ grains of dry matter, which consisted of—

	Grains.
Ammonia	21·5
Organic matters	77·6
Inorganic matters (ash)	518·4
	617·5

"The inorganic matter contained in this liquid consisted of—

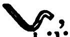
	Grains.
Alkaline salts	420·4
Phosphates of lime and magnesia	44·5
Carbonate of lime	31·1
Carbonate of magnesia and loss	3·4
Silica and a little alumina	19·0
	518·4

"These analyses thus clearly show,—

"1st. That liquid manure contains in a soluble state all the elements which a plant requires.

"2nd. That the liquid which flows from dung-heaps is more valuable to vegetation than urine alone, because it contains a considerable proportion of phosphate of lime, which does not exist in cows' urine, and also an appreciable quantity of soluble silica, which likewise is not found in urine.

"3rd. That rain-water not only removes the soluble substances occurring in urine, but also some of the most valuable fertilizers contained in the solid excrements. During the fermentation, a considerable portion of the soluble matters of the solid excrements are dissolved, and are lost with the alkaline salts and ammonia-producing matters of the urine, if the drainings of dung-heaps are permitted to run to waste."

An additional reason for carefully preserving the drainings is, that the salts of potash contained in the excrements of horses, sheep, and cows (being very soluble in water), are chiefly separated with the urine. Consequently, with the drainings of the heaps, the farmer also loses these highly fertilizing salts. The loss that manure in the open stock-yard thus sustains is occasioned less by the actual rain than by the pourings from the surrounding roofs. On an average, not more than two inches of rain fall every month, a quantity quite insufficient to wash away the valuable properties of the manure. But in many cases the surrounding buildings are without shoots, and a large amount of water is thus thrown into the yard. It would be sound economy to put shoots and down pipes to all such roofs. A very cheap and suitable eaves gutter for this purpose was some years since patented by Mr. Beaden of Taunton. The last tile is made to turn up thus, , and so form the gutter. Its advantages are, cheapness, durability, and impossibility of ripping in windy weather. It saves the two last rows of tiles, and costs, when fixed, about 6*d*. per foot run. For the purpose of fixing the ammonia contained in the liquid manure, gypsum is worthy of notice. Lime when applied to fresh urine, also answers well. It should be observed that lime acts in a different manner on putrid than it does on fresh urine. In the former case it liberates the ammonia; in the latter it forms nitrate of lime with those constituents of the urine which would otherwise have been converted into ammonia.

We have now to consider—

The best means of applying the Drainings of Dung-heaps.

From what has already been said, it is quite evident that a perfect manure cannot exist without the union of the constituents of the liquid with those of the solid manure. Therefore, as a general rule, these two good friends should never be separated. Cases, however, may occur that render the application of liquid manure very desirable. In Holland and some parts of Belgium its use has been attended with great success; what was originally a desert has, by its potent spell, been converted into a blooming garden. Much depends on the soil. In a light sandy district such a course might be attended with success, whilst on a clay soil it probably would prove a failure.* The Rev. Mr. Huxtable, Sutton Waldron, Dorset; Mr. Kennedy, Myremill, Ayrshire, Scotland; and Mr. Mechi, of Tiptree Hall, have each shown us what can be done by means of liquid manure. The two latter have a system of pipes laid down over the whole of their farms, by means of which they treat their young plants to refreshing, if not odoriferous showers of liquid manure.

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* See Professor Voelcker's Lecture delivered at Bath, Jan. 24, 1857.

Although these experiments have each been claimed as a success, it remains for time and practice to say if the outlay involved by this system will repay itself.

"The farm we call England cannot be cultivated at a loss." Undoubtedly there are many cases in which manure could be advantageously applied in a liquid form—as for instance at Edinburgh, where, by the application of liquid sewage, land, formerly nearly worthless, is now let at from 12*l.* to 32*l.* per acre. When a meadow is below the level of the farmyard, the liquid manure might, perhaps, be advantageously allowed to run over the field in a diluted form. We ourselves have seen a sidelong field which had thus been treated. The effect was very marked; the eye could trace with accuracy the course of the manure by the colour of the grass; while the cattle were not long in showing *their approval of the change.* The large amount of water which must be added to liquid manure to render it fit food for young plants, is a serious drawback to its general application by means of the water-cart. For, as every farmer well knows, liquid manure in its undiluted state would completely burn up the young plant, and thus its application involves the cartage of a large extra bulk of water. We incline to the opinion, that, considering the cost of transporting, and the necessity of having (as a general rule) a perfect manure, it is best by means of the pump and tank to return the drainings to the manure heap. These can then be transported into the field in a solid form.

Two arrangements for saving pig-manure, noted by Mr. T. D. Acland in his 'Farming of Somerset,' deserves attention (see Report, page 94).

> "One is, that devised by Mr. Raines, of Mells. A large hovel or outhouse is enclosed at the sides, so as to be at once warm and airy; the floor is paved and sprinkled over three-fourths of its length with burnt clay and ashes of weeds. On this part of the floor the pigs are fed, and they have a clean bed of straw railed off at the other end. A great quantity of excellent manure ready for the drill is thus made, and the pigs are always clean, warm, and comfortable. The other may be seen at Messrs. Fox's, the clothiers, at Wellington. They have a covered pit under a large wool-chamber 60 feet by 20 feet, into which all the litter of the beasts and horses is thrown, and all the liquid from the stalls and stables conducted under ground. The principle of box-feeding is then ingeniously applied, by a large number of pigs being kept in the pit; they enjoy themselves greatly, and thrive well, treading down and improving the dung. This plan has been adopted by a practical farmer in Hertfordshire, who says that his pigs have given him a profit by their meat, and left the dung as good as guano for nothing."

The Chemical Changes which take place in Dung-heaps, so far as is known.

We have said that much less nitrogen is contained in vegetable than in animal matters; yet, though this is true, the proportion of that element in the former class of substances is perhaps greater than is sometimes supposed. Ammonia, that is nitrogen, is evolved from both during decomposition.

But this is only one out of the many changes that occur. For instance, if we take the straw comprised in farmyard manure, there is little doubt that a large proportion of the carbon contained in it unites with the ammonia and forms the highly volatile gas carbonate of ammonia ($NH_3 CO_2$). Liebig says:—

> "A heap of manure lying unemployed will serve the farmer no more than his neighbours. The nitrogen in it would escape as carbonate of ammonia, and a mere carbonaceous residue of decayed plants would after some years be found in its place."—*Agricultural Chemistry*, p. 83.

In the albuminous ingredients of farmyard manure a certain proportion of unoxidised *phosphorus* is contained. This enters into combination with one or more of the elements set free during fermentation. It is a matter of considerable importance what compounds result from this union. If the phosphorus combines with oxygen, it forms phosphoric acid (PO_5), a non-volatile compound of great value to the plant. But if the phosphorus should unite with hydrogen and form phosphoretted hydrogen, or, more properly, hydrophosphoric acid (PH), the least evil that results is the disagreeable odour which is exhaled and which infects the air.

The affinity of hydrogen for oxygen is so strong that it will not only combine with disengaged elements, but will actually decompose existing combinations.

Thus hydrogen, if not otherwise engaged, will decompose phosphoric acid, and unite with the oxygen and with the phosphorus separately, forming in the latter case the offensive gas already alluded to, namely, hydrophosphoric acid.

Mr. Bowditch, at page 339 of the Royal Agricultural Society's Journal, 1856, observes, in relation to this:—

> "While the British farmer is hiring ships to bring him phosphorus from another hemisphere, he is literally wasting at home much of what he thus expensively imports. Countless thousands of manure-heaps, and still more countless 'middens' and ashpits in the three kingdoms, are sending forth their phosphorus as a volatile gas, which the winds bear away to advantage races of men who will inhabit lands as yet unformed; whereas, by better management, nearly, or even the whole, of this may be retained at home."

Sulphur likewise possesses a high agricultural value. Five per cent. of the hair and wool of cattle and sheep is sulphur, and this they derive from their food.

Sulphur must combine with three equivalents of oxygen and form sulphuric acid (SO_3) before it is in a form suited to the nourishment of plants. Sulphuric acid possesses the exceedingly valuable quality of uniting with and retaining the volatile ammonia, forming sulphate of ammonia ($NH_3\ SO_3$). Part of the sulphur of albuminous compounds appears to be unoxidized, and, as that metal has a greater affinity for hydrogen than oxygen, we find decayed vegetable matter giving off the intolerably fœtid gas sulphuretted hydrogen, or, more strictly, hydrosulphuric acid (HS).

But the dispersion of the sulphur is not the only loss. For the hydrogen (as in the case of the phosphates) dissolves the sulphates by forming water with the oxygen, for which it has an extraordinary avidity, and then unites with the sulphur as above. Here, then, is a twofold injury to the farm:—

1st. The sulphur is entirely lost, being dispersed in that most noxious and prejudicial compound hydrosulphuric acid; and

2nd. This combination actually assists the escape of the valuable ammonia; while if the sulphur were united with the proper proportion of oxygen to form sulphuric acid, this would unite with and fix that salt.

It is impossible not to be struck with the conservative influence of the *mineral portions* of our dung-heaps. *Potash*, *soda*, and *lime* have a strong affinity for the valuable phosphoric and sulphuric acids. Magnesia possesses the same property, and combines also with the phosphates to form double salts.

Hydrochloric acid, *oxide of iron*, and *silica* are endowed with the same attraction towards ammonia, and are thus valuable as fixers of that volatile alkali.

The comparative value of fresh and rotten dung has been a question of considerable discussion. As this involves the chemical changes that take place respectively, we will attempt an analysis of both. Professor Voelcker, in his elaborate article in the Royal Agricultural Society's Journal, 1856, institutes a comparison between farmyard manure 14 days old, and a similar manure after it has stood for 6 months.

The following are the results of this comparison. In fresh dung the proportion of *soluble* organic and mineral substances is small. This fully explains the slow effect produced by farmyard manure while in an unfermented state. On the other hand, the proportion of *in*soluble matters is very large, consisting chiefly of straw little changed chemically. Moreover, fresh dung contains a mere trace of ammonia, and only one-fourth of the available nitrogen that is found in rotten manure.

The *in*organic constituents of fresh dung contain all those mineral matters which are found in the ashes of our cultivated plants.

Now, rotten dung, say six months old, contains very nearly the same proportion of nitrogen that is found in fresh manure, while it is immensely more available. Well-rotten dung contains more than twice the *soluble* organic matter of fresh dung; and as the value of a manure rests chiefly on these compounds, this fact alone is sufficient to prove the superiority of fermented manure. The soluble *in*organic matters also are increased during fermentation.

Peculiar organic acids, not previously existing, are generated from the non-nitrogenised portions of the manure: such are humic and ulmic acid, which result chiefly from the decomposition of the straw, and which unite with ammonia and other salts, forming very soluble and non-volatile compounds. In a word, the proportion of nitrogen is far larger in rotten than in fresh manure; therefore the latter, in ripening, becomes more concentrated, more easily available to plants, and more beneficial and energetic.

The subjoined table represents the leading changes that occur in the fermentation of dung-heaps:—

	Fresh Dung.	Rotten Dung.
Organic	83·48	68·24
Inorganic	16·52	31·76
	100·00	100·00

Whence it appears that during decomposition the inorganic constituents are increased at the expense of the organic. Yet, as we have stated, the amount of nitrogen is larger in the latter than in the former.

Now, is this change effected without considerable loss of really valuable fertilizing substances?

It should be remembered that the abstraction of important minerals may, by proper management, be avoided. They are non-volatile, and must remain incorporated in the manure, if not washed away by the rain. The carbonaceous and non-nitrogenized substances are not of much value, nor need we regard their loss if they become converted into something better. Thus the question is simply—

Is the fermentation of farmyard manure necessarily attended with appreciable loss in nitrogen?

It would be thought that, as much of the nitrogen is converted into volatile ammonia, there must be decrease of nitrogen during fermentation; and, in fact, a very serious deterioration would take place if this process were not simultaneous with the formation within the manure-heap of excellent fixers of ammonia. A variety of experiments shows that far more ammonia is washed away from manure-heaps than escapes into the air; at the same time that the rain removes much of the ammoniacal salts, it carries off also soluble nitrogenised organic matters and valuable mineral constituents. And since rotten dung contains more soluble material, it is also more readily than fresh manure affected by the rain. We, therefore, conclude this portion of our subject with a caution to the farmer to keep his dung in waterproof pits, and covered with earth or mud-scrapings, so that there may be no loss either by draining or by volatilization.

To sum up these remarks: We find that farmyard manure is a perfect manure, since it contains all the elements necessary to the growth of plants. That of these constituents nitrogen is the first in value, and next to this phosphorus; that therefore it is of great importance to preserve these ingredients; that they are conveyed to the soil in the form of ammonia and phosphates respectively, and that these are evolved during the process of fermentation; that the effect of compression on dung-heaps is to retard, and of turning to expedite, fermentation; that it is necessary, in order to prevent waste by volatilization, to cover the dung-heap with earth; and in order to avoid loss by the running away of the soluble materials, it is expedient to construct waterproof pits, from which the drainings should be conveyed to tanks, and thence restored to the heap when it becomes dry.

Lastly, we learn that the chemical changes which occur in dung-heaps are both numerous and important: that just as a rotten apple will infect surrounding sound ones which are in contact with it, so the putrefaction of manure, when once commenced, is propagated throughout the whole heap, while during these changes no loss of fertilising qualities need occur if only proper precautions be taken to prevent it.

In a word, the practical farmer will find the chemist an efficient friend, the more valued inasmuch as he saves him no little expenditure of time and money.

VII.—*The Management of Farmyard Manure, considered Chemically and Practically.* By HENRY TANNER, Land Agent (Senior Member of the Royal Agricultural College, Cirencester), Puddington, Crediton, Devon.

PRIZE ESSAY.

I AM desirous of contributing a few remarks upon this subject, because I feel it is a question of vital importance in the successful management of a farm, and I doubt if any branch of rural economy more fully merits our attention, or has more imperative claims upon our careful consideration, than the one I now venture to bring under your notice. The *profitable* prosecution of agricultural operations is intimately connected with a correct management of those fertilising matters which compose the manure of our farmyards. It may be considered as the most variable of all fertilisers, both as regards the substances of which it consists, and also as to its value for the promotion of vegetable growth. It is therefore necessary for us to inform ourselves *fully* as to the composition of the substance we are dealing with, and to have some acquaintance with the materials which constitute this important manure.

This manure consists of excrementitious matters of the live stock of the farm, intermixed with straw or other materials used as litter or bedding for the animals. It is manifest that the composition of this mass must take a very wide range, according to the conditions and circumstances under which it may have been produced. It is clear that the food the animal consumes must influence the character of the excrement; for instance, that produced from a food containing a large proportion of nitrogenous matter, as corn or cake, would be very different from the excrement of an animal living entirely upon straw, which is chiefly carbonaceous matter. The age and character of the animal feeding upon the food must act in a similar manner, for, whereas a full-grown animal would only abstract from the food materials for replacing the waste of its body, a *growing* animal would *also* require the structure of its body to be built from the several ingredients of the food, and thus the latter would more fully impoverish the food it received, by drawing from it matters for the development of its *skeleton*, its muscles, and tissues. In the former instance, the *matured* animal would not separate any of this phosphate of lime for the formation of bone, and considerably less of the gluten and similar nitrogenized compounds from which the fleshy parts of the body are formed. When an animal has become so far matured that there is an entire cessation of growth, then, although there would be a transfer of some of the elements of the food to restore the waste of the body, yet, as the portion thus removed would be added to the manure, there would be simply *an exchange of the same elements*, and hence for all practical purposes we may consider the manure to contain all the matter which was present in the food, with the exception of that used in respiration. This represents the case of a fully matured animal, but we rarely meet with such instances, and the nearest approach will be amongst our fatting stock. A fatting animal may combine other conditions; for instance, a *growing* animal may have to be fattened in common with another which has attained its full growth; but it will be rendering my remarks more explicit if we separate these classes. I shall presume that I am dealing with an animal which has a skeleton that is fully developed, and therefore it does not need those supplies of phosphate of lime which would otherwise be necessary. This animal receives fattening food—it may be, for instance, corn or linseed cake—which passes into the stomach, where, by the aid of the digestive and absorbent vessels, *that portion which the body requires* is separated, and the residue passes away as excrementitious matter in various forms. In such a case the manure is deprived of the fat-producing compounds which it contained, and many valuable ingredients remain in the excrement, which would have been appropriated had they passed through a growing animal. For the same reason, if an animal receives more food than the digestive system can prepare or the absorbents appropriate, it must necessarily be wasted by passing away in the manure *unused*, and in the same degree the manure would be enriched thereby.*

In the case of those animals which are used for the breeding and rearing of stock, also for dairy purposes, we have a special demand upon the food, and thus, although the animal itself may be fully matured, yet, as she has to nourish the young animal, the food yields up its phosphate of lime and other nutritive properties, both before and after birth. Hence all breeding and milk-producing animals severely impoverish the food they receive, and their manure is consequently of less value. There are several other conditions which influence the character of farmyard manure, such as the proportion between the straw or litter used and the food consumed; but its value is especially controlled by the care taken in its preservation and management, and it will be my endeavour in the following essay to direct especial attention to these points of the subject.

The conditions, which influence the composition of farmyard manure, render it one of the most variable compounds we know, and the accuracy of chemical analysis is, to a great extent, rendered valueless in determining its component parts and their relative proportions. The produce of the same farmyard would yield very different results upon each examination, and the manure from separate establishments would offer even greater contrasts. It therefore becomes a matter of some difficulty to determine what may be considered to represent the average composition of farmyard manure. Nor is the difficulty lessened by the *small* quantity operated on in an analysis, and which therefore requires especial care on the part of the investigator. The composition of farmyard manure has been recently examined by Dr. Voelcker. I have extracted two of his analyses from the R. A. S. Journal, vol. xvii., showing the composition of fresh and well-rotten farmyard manure, the produce of a mixed stock of cattle, horses, and pigs.

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* Not quite "in the same degree." The oily matter would not enrich the manure.—ED.

Detailed Composition of Farmyard Manure.

	Fresh.		Well Rotten.	
Water		66·17		75·42
*Soluble organic matter		2·48		3·71
Soluble inorganic matter (ash):—				
*Soluble silica	·237		·254	
Phosphate of lime	·299		·382	
Lime	·066		·117	
Magnesia	·011		·047	
Potash	·573		·446	
Soda	·051		·023	
Chloride of sodium	·030		·037	
Sulphuric acid	·055		·058	
Carbonic acid and loss	·218		·106	
		1·54		1·47
†Insoluble organic matter		25·76		12·82
Insoluble inorganic matter (ash):—				
Soluble silica	·967		1·424	
Insoluble silica	·561		1·010	
Oxide of iron and alumina, with phosphates	·596		·947	
Containing phosphoric acid	(·178)		(·274)	
Equal to bone earth	(·386)		(·573)	
Lime	1·120		1·667	
Magnesia	·143		·091	
Potash	·099		·045	
Soda	·019		·038	
Sulphuric acid	·061		·063	
Carbonic acid and loss	·484		1·295	
		4·05		6·58
		100·00		100·00

* Containing nitrogen	·149	·297
Equal to ammonia	·181	·360
† Containing nitrogen	·494	·309
Equal to ammonia	·599	·375
Whole manure contains ammonia in free state	·034	·046
,, ,, ,, in form of salts	·088	·057

These analyses show very clearly what we may consider to be the composition of farmyard manure upon a well-managed farm, with an average portion of mixed stock. They are given very much in detail, and will enable the reader to see the chemical substances which generally compose this important manure, and the relative solubility of the various substances according to the degree of fermentation which the manure has undergone; but the proportions of these substances, in the original analysis, cannot however be looked upon as in any degree constant; but, on the other hand, these proportions will be found most variable. I have already observed that the composition varies to such an extent, according to the character of the food and the animal consuming it, that chemical analysis is consequently rendered almost *valueless* in showing what is the composition of farmyard manure, for an examination of one sample is no guide as to the composition of another, *unless produced under the same circumstances;* but it is of *the greatest value* for informing us of the changes which the same manure undergoes according to the subsequent management it receives, as we shall have an opportunity of seeing subsequently. The analyses quoted represent the composition of *good* specimens of farmyard manure, and may be taken as a fair illustration, and I shall proceed to notice the value of these materials which are present in farmyard manure.

The value of an article is modified by many circumstances, amongst which the principal are the relation of the supply to the demand, and the incidental expenses attendant upon its employment. *The intrinsic value of a manure must be estimated by the result* it produces, and this will regulate us in purchasing only such manures as admit of an advantageous investment, by being of greater *real* value than the expenses which attend their purchase. The *market* value is quite another consideration; the price of the article here depends simply upon the relation of supply and demand. For illustrating this point, let me refer you to the cases which have been made public, of better results being obtained from inferior manures than from others acknowledged to be of greater value. It has been shown that one shilling's worth of lime has been more effective in some instances than one pound's worth of guano. This result would guide the farmer who had attained it in his selection of lime rather than guano, but it would not lead him to give 12*l.* or 14*l.* a ton for his lime, because it is of greater *real* value to him than guano. On the contrary, he would purchase that which was of *the greatest intrinsic value,* but he would purchase it at its *market value.* The market value of the principal fertilizing elements of manure has been determined with much accuracy, and the value now generally accepted is shown as follows by Professor Way (R. A. S. Journal, vol. xvi., p. 539):—

	d.	
Nitrogen	$7\frac{3}{10}$	per lb.
Ammonia	6	,,
Phosphate of lime	$0\frac{3}{4}$	,,
Soluble phosphate of lime	$3\frac{1}{2}$	,,
Potash	$3\frac{3}{10}$	,,

Being in possession of these prices, we are in a position to apply them to the analyses already given, which will enable us to estimate the value of the chemical constituents of farmyard manure at their present market value. In order that this may be clearer to the minds of some of my readers, I have not shown the analysis in the form of a percentage, but I have calculated it so as to show the number of pounds' weight in every ton of manure, for this appears to me to be more likely to be appreciated by the practical agriculturist. The following Table shows the number of pounds' weight of the various substances named in one ton of fresh and also of rotten farmyard manure, and the value of the same:—

The Composition and Value of Farmyard Manure, calculated from the Analyses made by Dr. Voelcker.

	FRESH.		WELL ROTTEN.		PRICE.
	Number of lbs. in each Ton.	Value.	Number of lbs. in each Ton.	Value.	
		s. *d.*		*s.* *d.*	Per lb.
Water	1482¼	..	1689¼	..	
Soluble organic matter	55½	2 0	83	4 0	Ammonia 6*d.*
Soluble inorganic matter:—					
Soluble silica	5¼	..	5¾	..	
Phosphate of lime	6¾	0 5	8½	0 6½	¾*d.*
Lime	1½	..	2½	..	
Magnesia	¼	..	1	..	
Potash	12¾	3 3¾	10	2 9	$3\frac{3}{10}$*d.*
Soda	1¼	..	½	..	
Chloride of sodium	¾	..	¾	..	
Sulphuric acid	1¼	..	1¼	..	
Carbonic acid and loss	4¾	..	2¾	..	
Value of soluble matter	..	5 8¾	..	7 3½	
Insoluble organic matter	577	6 9	287½	4 3	Ammonia 6*d.*
Insoluble inorganic matter:—					
Soluble silica	21¾	..	32	..	
Insoluble silica	12½	..	22½	..	
Oxide of iron and phosphates	13½	0 6½	21¼	0 8¾	BoneEarth ¾*d.*
Lime	25	..	37½	..	
Magnesia	3¼	..	2	..	
Potash	2¼	0 7½	1	0 3¼	$3\frac{3}{10}$*d.*
Soda	½	..	¾	..	
Sulphuric acid	1¼	..	1½	..	
Carbonic acid and loss	10¾	..	29	..	
	2240	7 11	2240	5 3	
Value of insoluble matter ..	..	7 11	..	5 3	
Value of soluble matter	..	5 8¾	..	7 3½	
Total value of a ton of manure	..	13 7¾	..	12 6½	

Here then we observe that these samples of farmyard manure contained fertilizing substances in each ton worth from 12*s.* 6*d.* to 13*s.* 6*d.*, according to the fermentation which had taken place; the ingredients of the manure being worth 13*s.* 6*d.* per ton when fresh and unfermented, and only 12*s.* 6*d.* when well rotten.

It is, however, to be especially remarked, that these valuable fertilizers form but a very small proportion of the entire mass, as shown in the following Table:—

	Fresh Manure.			Well Rotten.		
	Cwts.	qrs.	lbs.	Cwts.	qrs.	lbs.
Fertilising substances	0	0	47¾	0	0	47¾
Other materials	6	1	10	4	1	27
Water	13	0	26¼	15	0	9¼
	20	0	0	20	0	0

It is therefore evident that in farmyard manure we have the active fertilisers in a very bulky form, and that, to convey to the land the 48 lbs. of absolute manure, we have to carry with it from 13 cwt. to 15 cwt. of water, and from 4 cwt. to 6 cwt. very inferior matter. Here then we see one reason why, in many cases, the portable artificial manures (which may be looked upon as the active principles of farmyard manure) are to be preferred to dung when required for hilly or distant fields. To convey to our fields 48 lbs. of *absolute* manure, we are compelled to carry 2240 lbs., and hence the labour of carriage has to be considered. In practice, however, the difference is even greater, for scarcely 1 in 1000 of the farmers of this country preserve their manure as well as the samples which were analysed. There was no drainage from this manure, it was not exposed to the washing of the rain or the evaporating power of the sun, it was preserved in all its strength, and therefore the difference would be very much more marked if we were to examine specimens of ordinary farmyard manure.[*]

I must not, however, convey the impression that these powerful fertilizers represent *the entire value* of the manure. Besides this, which may be termed *the very essence of the manure*, there are other materials which also play their part in promoting vegetable growth. The mechanical effect of farmyard manure is not to be lost sight of, for plants, like animals, need not only food but room to breathe and to perform other functions of life; in fact, the one is useless without the other. You may furnish

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[*] Dr. Voelcker has given the following Analysis (Jour. of Royal Agr. Soc., vol. xviii. p. 137) of the drainings from Fresh Farmyard Manure, showing the quantity of matter in one gallon:—

Ready-formed ammonia (principally present as humate and ulmate of ammonia)	15·13
Organic matter	716·81
Inorganic matter	625·80
Total amount of solid matter	1357·74

It is therefore evident that in allowing this liquid to be wasted we are depriving the manure of much that is valuable; and where this is allowed to escape during the whole time the dung is being made, the real value must be placed at a low figure.

the plant with an abundant supply of food, but, if the mechanical condition of the soil does not offer facility for its growth, the plant cannot reap any advantage from this food. Thus it is that the tillage of the land is so essentially *a necessary auxiliary* to the best manures. That which facilitates the roots in search after food, and promotes their healthy action, must have a favourable influence on the development of the plant, and thus we find farmyard manure valuable, not only as a *food*, but in ameliorating the character of the soil, admitting atmospheric air and changes of temperature, by its decay evolving gases which are useful promoters of vegetation, and, by its fermentation, producing heat in the soil, which promotes germination and subsequent growth. Hence we must not too quickly condemn this bulky addition as entirely valueless, for, although it may appear a disadvantage, yet there are compensating reasons which should lead us to attach value to it. In fact, it appears to me to illustrate with some force the opinion now entertained that the value of our active manures is very much increased by a more complete distribution through the soil; and if we followed this example more fully than we do, and thoroughly intermixed our artificial manures with other matter so as to distribute it more perfectly, I believe much advantage would result.

In order that the reader may clearly see the principles which should guide us in the management of farmyard manure, I shall proceed to notice the *chemical changes which take place in dung-heaps.* These changes are complicated and numerous, yet at the same time there is a simplicity about them which all must admire, and from the entire process we may draw some valuable hints which will lead us to a correct conclusion respecting the proper mode of managing farmyard manure. To make these changes the more readily understood, let the reader banish from his mind all terror for scientific terms, and I will endeavour to introduce four members of this family which play an important part in the affairs of vegetable life. These four substances are the principal constituents of all organic matter; they are known as carbon, oxygen, hydrogen, and nitrogen. They are subject to certain fixed laws which they must obey, and yet they *appear* so fickle in their attachments that you would almost doubt upon first acquaintance the fact of their being under law. They form a variety of groups, in some of which all are present, in others only two or three. We are practically acquainted with some of these little family circles, and I shall inform you of the individuals* which compose some of these groups; but instead of giving you their full names, I shall simply take their initials:—

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* I omit the equivalents, because, if gone into, they render the question more complicated, and are unnecessary, for I simply wish to convey to the agricultural reader a familiar knowledge of the principal changes.

Carbonic acid consists of	C. and O.
Water consists of..	H. and O.
Ammonia consists of	N. and H.
Humus, &c., consists of	C. H. O.

These are the little groups which by their union and separation do so much good or harm for the farmer, according as he treats them so as to retain their beneficial aid, or disperses them into other hands. We must now leave these groups for a short time, whilst I take a rapid glance at the preparatory movements which bring them into operation.

The manure of our farmyards consists, as I have before said, of vegetable matter which has either been used as food or as bedding. This vegetable matter before being used had been grown, and in its process of growth its development took place, steadily and gradually, by the addition of one organ after another, until in the fully developed plant we find it consisting of organised matter, or, as it is more generally termed, *organic matter*. The object of this plant's growth is complete so soon as it is thus fully developed, and in this condition we find it fitted by nature for some wise purpose in the economy of animal or vegetable life. It now becomes used for the purpose for which it was designed; but in its use it is not destroyed, it is only changed, and the same matter is capable of again being so transformed that it may either be formed into the same substance or assume some new form. But in doing so this organic matter *recommences* its course by a dissolution of its parts into their original elements subject to the laws which hold them in control. Thus, for example, we cultivate our corn crops and root crops, and we secure them in their full development. Our cattle consume the corn and the roots, and the straw is used for bedding, and our vegetable produce returns to the farmyard in the form of manure. But their employment does not end here, they have again to perform another circle, and we may perhaps watch their movements with interest and profit.

In the farmyard manure we have these four substances, C, H, O, and N, in a variety of combinations; but the most important changes are exceedingly simple. No sooner is the excrementitious matter exposed to the atmospheric air than a change commences in it. One of the elements which we call N. (nitrogen) is most unsettled in its disposition, and even under circumstances when the others might be disposed to remain quiet this one is not so inclined, and we always find it most prominent, not only in making changes itself, but it incites others to change also. Hence we find the substances which contain C. (carbon) in large proportions, although not equally disposed to ferment, are thus drawn into action almost as soon as any others, and this especial arrangement will be seen to be most important for the proper decomposition of the manure. The action of the nitrogen compounds in this instance may be illustrated by the familiar example of yeast when added to flour, for when these are mixed a chemical action rapidly ensues, not only in the fermenting matter itself, but throughout the entire mass of flour, and thus the flour (which is not of itself disposed to any immediate change) is so acted upon by contact with the yeast (which is predisposed to change) that it enters with freedom into the decomposition already commenced. As I have before stated, we have in the farmyard manure some of the N. (nitrogen) compounds, which are predisposed to decomposition, and we have others, C. (carbon) compounds, but slightly disposed to undergo a change of composition; but as soon as they become intermixed a violent action commences, which rends asunder the individual elements of the various matters in the dung, and affords them the opportunity of forming new associations. It is here that we need a knowledge of the principles involved in these decompositions, in order that we may promote the formation of those new groups which are most valuable as fertilisers, and secure them when thus formed.

Having seen the exciting *cause* of the fermentation which proceeds in farmyard manure, we may proceed to investigate *the change* which is effected. The presence of atmospheric air and water is necessary to render the decomposition complete, as each assists by yielding elements which enter into the action. The tendency to decomposition being communicated to the manure, one of the earliest changes is the union of O. (oxygen) with some of the vegetable matter, and the elements which are thus acted on are either C. (carbon), or else C. and H. (carbon and hydrogen). The probable result would be the formation of carbonic acid, or humus and its allies.* This change has been correctly described as a slow combustion, for the difference is more in the *rapidity* of action than either in the chemical union or the result. But whilst the bodies containing C. (carbon) are being decomposed, others containing N. (nitrogen) are also undergoing change, and we find the N. they contain laying hold of every portion of H. which comes within its power, and then the N. and H. unite and form ammonia. Thus we have three new compounds formed, viz. carbonic acid, humic acid, and ammonia. But these cannot remain in each other's presence without uniting, and the result is the formation of carbonate of ammonia, or else the humate of ammonia. In the decay of vegetable matter there is a very large quantity of the humus compounds formed, and these are the great conservators of the ammonia, because they form compounds of ammonia *which are not volatile.* When carbonic acid unites with ammonia we have a compound of very different character, for the carbonate of ammonia is very volatile, and hence, whilst the former compound remains fixed, the latter is easily dispersed. Recent investigations* have shown that nearly all the ammonia formed *in a well-regulated* fermentation is secured as humate of ammonia, and that the volatile ammoniacal compounds escape in small proportions. Although the humate of ammonia is not volatile, yet it is dissolved in water with very great ease, and hence, although this valuable fertiliser is secured from loss in the air, yet it is not safe from the action of water, and consequently we find very large quantities of it in the black streams which are too often seen running away from manure-heaps, bearing away that vital principle upon which their value depends.

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* There are many compounds which come under this description, humic acid, ulmic acid, and geic acid, being the principal; but as these are almost always intermixed in fermenting manure-heaps, and vary chiefly in having more or less of the elements of water, whilst they appear to act in a very similar manner upon the alkalies which are present, it is not necessary for me to specify the several branches of this humus family, but I shall in this essay take humic acid as the representative of the other compounds, unless the contrary is expressed. I do this because I feel the importance of avoiding the use of unnecessary and technical terms, which, although fully appreciated by the scientific reader, are not welcomed by the more numerous portion of our agricultural readers. For the same reason I claim the reader's indulgence for a familiarity of language in explaining some of the chemical changes.

As the fermentation advances through its various stages, we find a great decrease in the weight. This decrease has been variously stated, and must vary with the care taken of the manure; but the following will represent the loss of weight under general management:—

100 cwt. fresh manure = 80 cwt. half rotten.
" " = 60 cwt. rotten.
" " = 40 cwt. very rotten.

This decrease has been shown to consist almost entirely of carbonic acid, carburetted hydrogen, and other substances which are really of little value as fertilizers. The inference drawn from this is, that, under a properly regulated system, the *manurial* value of farmyard manure is scarcely depreciated by its fermentation. We must not, however, hastily conclude from this, that it is always desirable to have our farmyard manure thoroughly rotten, for there are other points to be considered, which will modify our judgment; and the mechanical action of the dung upon the soil claims consideration as well as the chemical composition. To this point reference is made in other parts of this Essay.

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* Journal of Royal Agricultural Society, vol. xvii.

There is, however, another reason for the exercise of caution in not carrying the fermentation too far, and this depends upon a peculiar property possessed by the insoluble organic matter. The partially destroyed tissues have the power of separating from the surrounding atmosphere considerable quantities of ammonia, and then retaining it until removed by the passage of water or further decay. This property is of considerable importance in the fermentation of manure, for, supposing more ammonia formed than could combine with the humic acid which might happen to be present, it would have a tendency to escape into the air; but this peculiarity of insoluble organic matter retains it, and thus much is preserved which would otherwise be lost. It is evident that, if we deprive the manure of this property by allowing it to be thoroughly decomposed, its value is materially decreased, and I believe without any corresponding advantages.

In considering the chemical changes which take place in farmyard manure, I have hitherto confined my remarks to the *organic* matter it contains. I have now to remind the reader that vegetables possess a mineral framework or skeleton, and this mineral matter is imbedded in the tissues of the plant, giving them that strength and rigidity which is necessary for their healthy development. Being mineral matter, it can be easily separated from the combustible portion by the aid of fire, and hence, after we have burnt the vegetable matter, a substance remains which cannot be burnt, and this is known as the ash of the plant. The composition of this ash varies very much, for different plants appear to require different materials for the formation of their structure; and although the ash of a plant grown upon one soil, say chalk or limestone, may differ from the ash of the same variety grown upon another soil, a clay soil for instance, yet there is still an uniformity of character preserved by each individual plant, and the limit of variation is kept within fixed bounds. Upon this inorganic matter much of the value of our farmyard manure depends, and in the estimated value already given it amounts to about one-third of the entire value of the chemical ingredients of the manure.

The decomposition of the various materials contained in farmyard manure necessarily breaks down all the tissues and cells of which each plant was originally constructed; and as each plant becomes resolved into its original elements, the inorganic or mineral matter becomes freed from the tissues and cells, and is therefore capable of being dissolved in water, which could not be effected so long as it remained embedded in the organism of the plant. Hence we find in the process of fermentation our surest plan of rendering the inorganic matter of manure available for the process of vegetation, for until it is soluble in water it is entirely useless as a food for plants. At the same time we find some of these materials, which are naturally difficult of solution in water, become so modified in their condition and constitution during the process of fermentation as to be readily soluble, and bone earth or phosphate of lime is an instance of this peculiar action. The careful and elaborate analyses which have been published by Professors Way and Ogsten in the R. A. S. Journal represent to us most clearly the inorganic constituents of our various crops. If we compare with these results the inorganic constituents of farmyard manure, we find that the requirements of our crops are all comprised in this the most valuable of all manures. Hence we can see at once one reason for the universal testimony of practical men in its favour, as being adapted for promoting the development of each and all of our crops.

Temperature has a powerful influence upon fermentation, for it cannot take place below the freezing-point (32° Fahr.), and, with an increase of heat, the action becomes more rapid. Thus we find fermentation more rapid during the summer than in the winter, other circumstances being equally favourable. In the manure-heap, however, we have a source of heat which originates within its own limits, and which most powerfully stimulates and promotes this fermenting process. It has been ascertained that, whenever chemical decomposition or chemical union occurs, there is an amount of heat evolved which is sensible to the thermometer. We have already noticed some chemical actions of the character described, such as breaking up of certain groups of elements and their forming new associations, but none of these changes can take place without heat being produced by this transfer from one combination to another. The movement being commenced, an increase of heat is the immediate result, which promotes the decomposition, and hence, the more rapid it is proceeding, the more powerfully does the stimulus act. We may naturally inquire, if such be the case, how is it that in practice we do not find greater inconvenience therefrom? To explain this I must remind the reader that the presence of air and water is necessary for a rapid fermentation, and hence it is a want of materials which checks the too rapid progress of these chemical changes. The excessive heat we often observe in the centre of a manure-heap would render fermentation *most violent*, if it were not held in check from the want of a supply of air and moisture; but, in the admission of these supplies, we prepare an aperture by which the heat is enabled to escape, and, the heat not being any longer confined, the manure does not reach such a high degree of temperature.

When the temperature becomes thus excessive, we may assume that there has not been as free a supply of air and moisture as the fermentation required, and here it is that the carbon of the manure becomes formed into carbonic acid, being unable to obtain that supply of the hydrogen of water which would have formed it into one of the humus compounds. Hence we have carbonic acid formed, and it combines with the ammonia there formed, and the result is a very volatile salt (carbonate of ammonia), which the high degree of temperature helps to disperse into the atmosphere. Presuming that we could have maintained a steady supply of air and water, we should not have had this excessive heat, and, instead of the volatile carbonate of ammonia, we should have had the humate of ammonia, which is a fixed salt and highly soluble in water. It is believed that the greater portion of the *volatile* ammonia is thus formed, and that generally towards the outside of the heap we have the ammonia combined with the humus and its kindred compounds.

We are now in a position to enter upon another part of our inquiry, for, the reader being already informed as to the materials which constitute farmyard manure, and the peculiar chemical changes which these substances undergo, it remains for me to show the manner in which we can modify our proceedings so as to attain the result we desire, and I shall therefore proceed to notice *the proper management of farmyard manure.* The object aimed at is to bring farmyard manure into *that mechanical and chemical condition which is most congenial to vegetation*, with the least amount of sacrifice. In fresh farmyard manure we have all the elements necessary for promoting vegetation, but these elements exist in other combinations than those which the growing plant can assimilate, therefore we must change the character and condition of the manure by the aid of fermentation. The change thus produced in the manure is the conversion of insoluble matter into other compounds which will dissolve in water, and hence, if we would preserve our manure, we must be exceedingly jealous of all kinds of waste. It is evident that we are increasing the danger of losing much that is valuable, unless, at the same time, we avoid all loss in the form of drainage from the heap. This at once leads us to consider the requirements of a proper *place for keeping the manure* during the time of its accumulation and fermentation. The advantage of an excavated spot with sides and bottom which will prevent all loss by drainage is very evident. Local circumstances would lead to a variety of forms for supplying the object we have in view, viz. preserving the liquid portion of our manures from being lost. It is a "sine quâ non,"—a condition upon which all success depends. It may be square or oblong, shallow or deep, as other circumstances may render desirable, but the imposed condition is that it must not admit of any loss of the liquid. We shall derive great advantage from having a manure-tank, in close proximity to this manure-pit, to receive any excess of moisture which the heap may receive, and from this tank it may be pumped on the heap from time to time. The consideration of having it covered by a roof must be regulated by the circumstances of each case. The proportion which the depth bears to the superficial extent of the manure receptacle is one point to be noticed, for it is clear that, if we double any given depth, we shall have the same room for manure with one-half the superficial area, and consequently this manure-pit receives only one-half the quantity of rain which the other does. The average fall of rain in the district is another important point, for it is clear that, with 24 inches falling in the east of England and 44 inches in the west, we ought to modify our practice. The time of the year during which the manure is chiefly accumulated would in some measure influence our decision, for, if exposed to the excessive heat of the summer sun, the manure might suffer a loss which would not occur during the winter months. Added to these considerations, we have to remember the proportion of litter used, for, if the farm is abundantly supplied with straw, it would be more liberally used than upon another where the supply of straw happened to be very limited. These are the principal points to be considered in relation to the accommodation needed for the preservation of manure, and the pros must be balanced against the cons. Should the climate be wet and the supply of straw deficient, I should certainly be disposed to have a covered manure-pit. The expense of making a roof is but small, and, if there should be a doubt in any case, I should certainly decide in favour of a cover, because, under any circumstances, an additional quantity of water can be pumped on the heap, should it appear desirable to do so. We are not in a position to state the absolute quantity of moisture which manure requires for its proper decomposition, hence no definite line can be drawn; and I must, therefore, leave in the reader's hands the principles which should guide him, for him to apply them as may be necessary. Many circumstances will arise to render it necessary to remove the manure from this place of deposit. The manure-pit will become filled from time to time, and another resting-place must be found for the manure; but, besides this, it will be necessary to facilitate the labour of our busy seasons, by having the manure placed in convenient positions near the land upon which it is going to be used. This renders it necessary for us to consider as to its safe custody after leaving the manure-pit, for it is evident that now it is more susceptible of injury than when quite fresh, and this brings me to notice the best plan for making a dungheap. This first step consists in selecting a suitable spot for making the heap, and we must secure if possible a *clay* bottom which is retentive of water. The surface should be hollowed out by the removal of some of the clay, which should be placed beyond the line of the sides of the heap, as this will be useful subsequently. The foundation of the heap should be prolonged at both ends 5 or 6 feet, for the loaded carts have to be driven over the heap, and this allows of room for a gradual ascent and descent. As soon as several loads of dung have been properly spread, the loaded carts may commence passing over the heap so as to deposit the manure upon the top. It is then spread regularly over the top, and the sides built up with some care. As soon as the entire quantity is conveyed to the heap, the ends are cut back and thrown upon the top to make the heap into a proper shape, and in doing this it should be raised somewhat the highest in the centre. Some soil may be placed so as to form a covering of earth, which will not only keep in much valuable ammonia which has escaped from the manure below, but it will, when it has a nice smooth surface, turn off a large proportion of the rain which may fall upon it, and thus prevent the manure being washed. The ground around the heap should now be cleared, and any clay or mud carefully applied to the sides, so as to prevent the escape of liquid from the heap. The heap is now comparatively speaking secure from injury, and will remain so for many months, especially if the top and sides are occasionally watched and any damages rectified immediately.

When this manure-heap is opened for the purpose of applying it to the land, it will be found sufficiently rotten for use in the majority of cases; but should it be considered desirable to have it more thoroughly decomposed, it must be turned over, and then allowed to remain in this state for ten or fourteen days. But, in turning this heap, I should be equally jealous of preventing all waste by drainage, and for this purpose hollow out the bottom and plaster up the sides with mud as in making the heap originally. The top should again be covered with earth, even more freely than before, for there will be a pressure of ammonia arise from the heap, and the earth on the top will secure it from escaping into the air. In this removal of the manure let it be thrown together lightly after the parts have been well separated. I will now explain the reasons which induced me in the one case to use every means to compress the heap, and in the second to avoid pressure as much as possible.

It has already been stated that the presence of air was necessary for the process of fermentation, and that in the absence of air the action became impeded. When the manure was placed in the heap I wanted to check the fermentation, and therefore, by the pressure of the men, horses, and carts, I adopted the best means for excluding the atmospheric air. Subsequently, when I wished to render the manure more completely decomposed, I have it turned over into a fresh heap and the parts well shaken, so that it shall lie as light as possible, and the result is that a violent fermentation commences and is maintained so long as air can gain access to the manure. The tubular nature of the straw assists very much in this passage of air into as well as through the heap. We have thus a very considerable control over the fermentation, and in this manner we can make the fermentation more rapid or slower according as may appear most desirable. It is, however, worthy of mention that when a manure-heap has been turned over as above described, and a rapid fermentation excited in it by the free admission of air, the product of this action will depend upon the constituent elements which are present. From what has already been stated, the reader is well aware that the presence of water modifies the product, and if there is a deficiency of moisture we have a volatile salt of ammonia formed, whilst if there is sufficient for the fermenting process then we have another and *more valuable compound,* viz. the humate of ammonia, which, being a fixed salt, is of more permanent character, and of equal, if not superior, fertilising character. Here there is *one* of the greatest sources of loss in the management of dung, for we adopt measures to promote a violent fermentation, and *yet we do not supply moisture* to render the decomposition most complete and beneficial. I have, therefore, most strongly to recommend that, after a manure-heap has been turned, or, in fact, during any period *when the fermentation is vigorous, especial care should be taken to give fresh supplies of moisture, which will powerfully promote the formation of those ammoniacal compounds which are of the greatest agricultural value.* If there is any liquid drainage from the manure-pit this will be most beneficially employed by being pumped over the heap and allowed to pass through it. In the case of a manure-heap in the field *which has been turned,* I should not only allow the rain which falls to pass into it, but I should convey to it small supplies of water from time to time, and in the majority of cases these supplies can be obtained in tolerably close proximity. I wish here to be clearly understood that this addition of moisture will be valuable when a heap has been turned for the purpose of rendering its fermentation more rapid, and the judgment of the operator should guide him not to give such large supplies of water as will produce a drainage from the heap, for this must be very carefully avoided. Moderate and frequent supplies will be much more desirable than a single copious application.

These are the principal points to be considered in the manufacture of farmyard-manure, and it only remains for me to refer to its employment upon the land. It is a subject full of importance and having a very wide range. I shall confine myself to a consideration *of the principles which should determine the degree to which the fermentation of farmyard manure should be carried.* The agriculturist must settle this point before he decides upon the course of management most desirable for him to adopt, for, as various results should be sought after to meet varying circumstances, so a modification of system must be adopted to attain the special result required. The mechanical properties of farmyard-manure have already been alluded to, and they are chiefly characterised by rendering the soil more or less open. On clay soils of very tenacious and adhesive character this is a valuable property, because the free growth of vegetation is very much promoted by the freedom which the roots possess for searching after the food they need, and upon these soils we adopt every means at our disposal for loosening the soil and ameliorating its retentive character. On the other hand, on sandy land we have rather to give solidity and firmness to the soil, and our tillage operations have rather a contrary tendency. The manure, being a powerful mechanical agent, has also to be considered, and the same alteration of procedure will be observed in its use. As fermentation proceeds, the manure becomes reduced into a smaller bulk, and loses much of that rigidity of character which it possessed in an unfermented state, and this change continues until it becomes reduced to a soft greasy mass. It is manifest that in the latter condition its power of rendering the soil loose is considerably reduced, if not entirely destroyed, and therefore, apart from any other chemical consideration, we clearly lose its mechanical agency by allowing fermentation to proceed thus far. Upon clay soils which are very retentive, if we wish to attain the full mechanical effect of the manure, it can scarcely be applied too fresh, even before fermentation has made any advance. But upon sandy soils we want to do away with this property, for the soil is already sufficiently free in its nature, and the action of this mechanical agency would be prejudicial rather than otherwise. Hence, if we act merely with a view to mechanical effect, our course is clearly to apply the manure more or less fermented as the land may be more or less friable in its nature, and we shall find—between the extremes specified—gradations of soil requiring to be supplied with manure of various degrees of fermentation.

Nor is this the only ground which favours this decision, for upon chemical—as well as mechanical—grounds this is the correct course to adopt. It is satisfactory to know that, when fresh manure is ploughed into a clay soil, the fermentation of the manure will proceed *far more perfectly* than if we retained it under our own control, and that there is not the least danger of loss from imperfect or wasteful fermentation, for the absorptive properties of the soil guard with jealous care all the products of the decomposition, and preserve the same until yielded up to vegetation. Another advantage, which will arise from using the manure in a recent state, is, that all the heat produced by the chemical decomposition will add warmth to these naturally cold soils. We have, therefore, great inducements to use farmyard-manure upon clay soils, before the fermentation has advanced to any great degree, but we must proceed in a very different manner, when we have sandy soils to deal with.

If we consider the relative merits of fresh and well-rotten manure for use upon sandy and porous soils, we find that the use of the latter is to be preferred upon mechanical grounds, for the soil, being sufficiently open in its character, would not be improved by the use of manure in a condition which would render it less firm and compact. It is now my wish to show you that here also chemistry supports her sister science, and it is capable of proof, that also upon chemical grounds it is decidedly better to use manure upon soils of this class well decomposed. Unlike soils containing clay, which are peculiarly adapted by nature *to retain* the fertilising principles of manure, our sandy soils readily permit the water passing through them to wash out much valuable manuring matter. For this reason the manure should be well fermented *before* being buried under the soil, and only distributed over the land just prior to the growth of the crop for which it is intended. An opposite system would entail loss in every way, for, unless the soil is capable of retaining the manure, great sacrifice must result. Here, as in other cases, the reader, knowing the principles to be acted upon, will modify his proceedings according to the degree to which his soil may be characterised by either of these qualities.

These remarks have reference to those cases in which the manure is buried in the soil. If the manure were required for being spread upon the surface, say for young seeds or grass, &c., I should prefer using it moderately rotten, especially if applied early in the winter, but the later it is used in *this* season of the year, the more fully decomposed should it be. If manure is exposed at this time of the year, it has been shown by Dr. Voelcker that the loss is very inconsiderable, provided the soil contains a certain proportion of clayey matter, and this justifies that excellent practice of applying manure to the clover-leys which is adopted in some parts of England, and which, although it has been often considered a very wasteful system, yet has been well approved of in practice.

In closing this Essay I would enlist the reader's especial attention to the preparation and management of his farmyard-manure. Few of us have any idea of the loss even the most careful are daily suffering, and I sincerely hope that a knowledge of the constitution and properties of this manure may be of some service in guiding each to adopt an improved system. It will also make us watchful for further knowledge, and cautious against being prejudiced to any set of opinions or course of practice.

VIII.—*The Threshing-Machine.* By WILLIAM HEARD, Leiston Works, Saxmundham.

PRIZE ESSAY.

THE "threshing-machine" cannot be called a modern invention, seeing that it has been in use for upwards of a century: it was not, however, until a comparatively recent period that the efforts to produce a machine suited for general use were successful. As in the case of many other machines, it is to a Scotchman the credit must be given for inventing this very important one. Mr. J. A. Ransome, in his interesting work on the 'Implements of Agriculture,' published in 1843, informs his readers (at p. 139) that the first successful attempt to construct a threshing-machine was made in the year 1732, by Michael Menzies, a gentleman of East Lothian. No details of this invention are to be met with, and we have, therefore, but little to guide us in forming an estimate of its capabilities. The writer, however, proceeds to say, in the same work (p. 139), "that this machine was a contrivance by which a series of flails were made to revolve upon a cylinder;" and that a committee appointed by the Society of Improvers in Scotland reported favourably of its operations. Many other attempts at improvement were made during the following half-century, all of which, however, proved useless; and no one principle introduced during that period remains in use at the present day. It was not until the year 1785 that a machine was invented in which the "threshing-drum" was employed; and this also was the invention of a Scotchman, Andrew Meikle, of Tyringham, in East Lothian. The principle patented in this invention is that which is still followed in the construction of threshing-machines. Quoting from the same authority (p. 144), we find it stated that in 1786 Meikle erected a threshing-machine on his newly patented principle, which was found to work exceedingly well, and which was subsequently much improved and rendered portable by Mr. John Ball, of Hetheringsett, near Norwich. In this machine was introduced the principle of passing between two rollers the corn, which was struck by beaters fixed on a revolving drum. It will be seen, therefore, that it is now about seventy years since the ordinary "threshing-drum" was brought into use. Nothing like a *general* demand for these machines was experienced until a much more recent date. The long time it took to bring these machines into anything like general use was owing more to the inferior construction than the inefficiency of the principle contained in the same. Even as lately as the year 1841, at the Cambridge Meeting of the Royal Agricultural Society, of *eight* machines competing, but *two* only went through the trial, the others breaking down either through defects in the construction or materials. The quantity of work done by the two machines which completed the trial—manufactured respectively by Ransomes and May, of Ipswich; and Garrett and Son, of Leiston—was 61 bushels and ¾ of a peck, and 61 bushels and ¼ of a peck; both machines delivering the corn uninjured. No prizes were offered by the Society at this meeting for "threshing-machines," nor for some years subsequently. The first award having been made at the Shrewsbury meeting in 1846, when a special premium of 10*l.* was given for a "fixed combined threshing and dressing machine," exhibited by the late Earl Ducie, who rendered so much assistance to the cause of agricultural progress. At this meeting several threshing-machines were exhibited, of which the judges report (Royal Agricultural Society's Journal, vol. vi. p. 320):—"Several threshing-machines were set to work, but the judges are compelled to report the whole of those tried to be much below par, and unfit for good barn service." This special premium, therefore, doubtless being given as an incentive to manufacturers to improve this class of machinery rather than to note the presence of any particular merit in that exhibited by the Earl. At the next meeting of the same Society, held at Newcastle-on-Tyne, a prize was for the first time offered for the best "threshing-machine," which was awarded to that exhibited by Garrett and Sons; but, as no report of the trials which took place at this meeting was published, I have no means of ascertaining the quantity of work performed, or how it was done. I have, however, ascertained that the prize machine was fitted with the maker's patent bolting-drum, by which the grain was separated from, without injury to, the straw. This machine possessed a qualification wanting in all threshing-machines previously constructed, viz. the delivery of the straw not broken—an important advantage where it is required for sale. It may be assumed that since this period (1847) horse-power threshing-machines have not been materially improved: this is accounted for partly owing to these machines having but one process to perform, and that by no means a complicated one. When once capable of threshing clean, expeditiously, and without injuring the grain or straw, there was not much scope for alteration or improvement; and by reference to the publications of the leading manufacturers, containing descriptive particulars of these machines, published in 1847 and 1857, but little difference will be seen. Another reason why these machines have remained *in statu quo* is, that about the first-named period, or rather earlier, the attention of the leading manufacturers was turned to the production of an efficient machine to combine some part of the dressing process with the threshing, and especially adapted for being worked by steam-power. It should not be forgotten that it is, as I have previously stated, to the late Earl Ducie the credit must be given for originating the "combined threshing and dressing machine," although for all practical purposes the machine invented by his Lordship was a failure. About two years after this machine was exhibited we find that Mr. Walter Palmer, of Southacre, Swaffham, a Norfolk tenant-farmer, carrying out the Earl's idea, produced a "*portable* combined machine for threshing and dressing, adapted for being worked by steam-power." It should be borne in mind that this was a *portable* machine, and consequently it is Mr. Palmer we must thank for carrying out successfully the idea of a "combined steam-power threshing and dressing machine," and rendering it portable. Norfolk agriculturists may point to many similar instances in which some of the most valuable machines in use at the present day have been invented by them, showing how much practice has to do with the production of machines adapted for performing the various agricultural operations in an efficient and economical manner. Mr. Palmer derived much valuable assistance from Mr. Charles Burrell, of Thetford, who constructed the first machine for him. Mr. Palmer's patent was for the combination of the several processes of threshing, shaking the straw, screening, riddling, and winnowing, in a machine mounted on wheels. This was patented in the year 1848; and in the month of July in that year it was exhibited, and a silver medal awarded for it, at the York Meeting of the Royal Agricultural Society. It is from this time we must date the exhibition of "portable threshing and dressing machines" worked by steam-power; several apparatus of a similar description having been exhibited at the subsequent meetings of this and in the last few years of your Society, and, as may be supposed, very important improvements have been introduced into these machines in the last few years: their former unwieldy proportions have been materially reduced, the complicated arrangement of the working parts rendered more simple, and the machine of the present day bears but a small resemblance to those in use seven years since.

Having thus briefly sketched the introduction and gradual development of the horse and steam power threshing-machine, I will now proceed to consider what operations are needed for preparing grain for market. The first process to be performed is to detach the grain from the ear, or what is expressed by the term threshing. This process is in effect the same, whether it be performed by the flail or by the threshing-drum. The separation of the grains is carried one step further by the straw-shaker, by which stray grains are tossed out of the heap of straw, and the long straw is collected at one point by itself; the grain—good and bad, the chaff, and a quantity of short bits of straw being still mixed. The dressing operation now commences, and includes the riddling the loose ears and short straws from the chaff, blowing out the chaff from the corn, and screening the inferior kernels and rubbish from the marketable corn, rendering the sample clean and fit for sale. These operations are very nearly the same for every description of grain: barley, however, requires avelling, and when threshed by the flail or horse-power threshing-machine this is done by means of a roller or chopper used for that purpose, which cuts or rubs off the horns. These, however, are matters familiar to all agriculturists, and therefore it is not necessary for me to enlarge upon them. In order, however, to place the different operations required for preparing grain for market succinctly before the reader, and in their proper order, I will describe the performance of one of the most improved "portable finishing threshing and dressing machines," premising that it is worked by an 8-horse-power portable engine. Such machines may be procured of any leading manufacturer, and do not differ very materially in principle, although, as a matter of course, some are superior in general arrangement of the different working parts—some in one working part, and some in another. It would be invidious to point to any single machine as comprising the most effective working parts throughout, but I shall endeavour by-and-bye to give an impartial description of those parts in different machines which in my opinion have a fair claim to superiority. To resume a description of the working of the finishing machine. In the first place, the straw is passed horizontally in at the mouth of the machine by the man feeding; the straw then passes between the drum and concave (which, *i. e.* the concave, is generally constructed of splines of wood, plated with iron, having spaces between them, with wires running from one to the other), and is carried over a set a straw-shakers, where the loose kernels are separated from it, and it is delivered at the end of the machine: a large quantity of corn escapes through the spaces in the concave during the operation of threshing, which corn, and also that separated from the straw in its passage over the shaker, mixed with the chaff, short straws, and rubbish, is conducted upon a vibrating screen, in passing along which the corn and chaff fall through, and the cavings, short straws, and rubbish are delivered at the end ; the corn and chaff are then subjected to the action of the winnowing-machine, and, all the chaff being blown away, the corn passes through the avelling-machine ; and when barley is being cleaned it is at this time the process of avelling is performed ; and in many cases it is found advantageous to subject wheat to the same process, as it materially brightens and improves the sample, and destroys any bladders that may remain amongst the corn. From the aveller the corn passes to the elevators, which take it to the revolving or vibrating screen, that acts as a finishing dressing-machine, where it is again exposed to the action of the blast, and the marketable corn, seconds corn, dross, and chobs, delivered separately through spouts into sacks suspended at the end or side of the machine (the end is, I believe, generally preferred), when the process is complete. The desideratum is, of course, the delivery of the corn unbroken and thoroughly separated, so that no further dressing is needed to prepare it for market, the straw to be unbroken and free from corn; and, although some "portable finishing-machines" may do this, it is not by any means to be expected that all machines (so called) will do so: this leads me to consider the most perfect working parts in arrangement and construction best calculated to accomplish this.

In attempting to describe the arrangements peculiar to the combined machines of the leading manufacturers, it is obvious that it would be a waste of time to enter upon a discussion of the merits and demerits of each working part for which a claim to superiority has been made, as improvements have been constantly introduced into these machines; and it will doubtless still continue to be so. Moreover, parties desirous of learning full particulars as to the construction of these machines will find that few of the makers' catalogues supply them with the information they require, it being a very customary thing for manufacturers to call attention to the great superiority of this or that working part, seldom however adding sufficient particulars respecting it to enable any one to form an unbiassed opinion of it without seeing it at work : for this reason I find it very necessary to use extreme caution in calling attention to those parts of a combined machine that do the work in the most effectual manner, and are held in the highest esteem. To commence with the drum, as the first part brought into play, and perhaps the most important part of the whole machine. I find, on comparing the drums used by the leading manufacturers, there is but little variation in the principle or arrangement. Perhaps the best, or one of the best, in use is a patent of Mr. T. Goucher, of Worksop; and, from the fact of some of the largest manufacturers of combined threshing-machines using it, I think we may consider it calculated for performing the work in a proper manner, or, in other words, separating all the corn from the ears without breaking the kernels. This drum has a number of iron beaters, of an angular shape, with the outer edge rounded off, and a series of fluted projections in a spiral form fixed on the face of the beaters at a distance of about half an inch apart. I believe the merit consists in these projecting pieces, and that their peculiar action prevents any injury to the grain. The patent drum of Messrs. Barrett and Co., of Reading, is also well spoken of. In this the beaters are perforated at an angle of 45 degrees with the drum-spindle, with solid iron breasting; and the action of it is rather to *rub* out the grain than to *strike* it out; and it is therefore very light in draught.

To proceed to the straw-shakers. No part of the machine is less perfect than this; and in my opinion no really good straw-shaker has yet been introduced. Those in use either do not shake clean or employ too much power to drive them. Perhaps the shaker invented by Mr. T. Brinsmead, of Torrington, is as efficient, and requires as little power to drive it, as any. I regret that I have not sufficient particulars of its construction to warrant me in attempting to describe it. I see no reason, in the nature of the work to be performed, why a shaker should not be invented on some principle requiring less friction than any now in use, and therefore demanding less power to drive it, and yet taking all the loose kernels from the straw. The superiority that the Messrs. Humphries, of Pershore, claim for their improved form of riddle consists in the perforations being so made in it that they incline to the plane of the riddle, instead of being at right angles with the surface, and therefore do not allow of the pulse or short straws passing through them, and also prevent their passing partly through and then sticking so as to choke up the riddle. There is no very manifest superiority that I am aware of in the screening apparatus used by the leading manufacturers for finishing the sample. Those invented by Messrs. Boby and Bridgman, of Bury St. Edmunds, and Mr. John Palmer, of Stockton, are considered very efficient: the former consists of a plain, flat vibrating screen, which works in an inclined position, and is so arranged that by means of a screw the mesh is regulated to any degree of fineness required to adapt it for all kinds of grain and seed, and it is in the facility with which these alterations are made that its superiority consists; the latter is of a circular shape, with a rotatory motion; it has three different divisions of wire, of varied finenesses, and is fitted with a brush attached to the outside, which presses on the screen, and prevents the corn sticking in it. The action of this brush is regulated by means of a screw. The barley aveller and elevators in a good machine do the work in an effectual manner, are nearly alike in all machines, and call for no particular comment; but I ought not to omit to call attention to the "patent intermediate shaft," the invention of Messrs. Garrett and Sons, of Leiston Works. The practical benefit derived from the use of this shaft is the reduction of the wear and tear of the different working parts: the power by it, instead of being transmitted to the drum and thence to the different working parts of the machine, is conveyed direct to each working part; and by this arrangement it is obvious that the machine must work steadier and with much less wear and tear. Having thus described briefly, and I fear but imperfectly, those inventions held in most repute, I cannot help arriving at the conclusion that these machines are open to considerable improvement in many parts. A very general objection to them is that so great an amount of power is required to work them, and from so many operations being performed simultaneously, there is so much liability to their getting out of order, that the first cost is a very heavy one, and the renewal of brasses, spindles, and other wearing parts, forms a serious item; it is therefore very desirable that manufacturers, in their attempts to perfect these machines, should keep the following points in view:—

1st. The quality of materials and workmanship.

2nd. The most economical application of the driving power.

3rd. The avoidance of complication in the arrangement of the working parts.

4th. The proper and effectual performance of the different operations.

5th. The fixing of a reasonable selling price.

Having shown what operations are required to be performed in the preparation of grain for market, I will give an approximate estimate of the cost of performing the same by manual labour; and I am obliged to have recourse to past experience to enable me to arrive at anything like a correct result, for in most of the principal corn-growing districts machinery has to a very great extent superseded the use of the flail. At a first glance it may reasonably be supposed that the cost of preparing grain for market by means of *manual labour* varies considerably in different parts of the country owing to the rate of wages being higher in some parts than in others. I have made careful inquiry on this point in many parts, and find that, in almost every instance where the highest rate of wages is paid, more work is got through in the day; so that, in point of fact, the cost of preparing grain for market by manual labour is pretty much the same in all parts of England. In the large corn-growing districts in the east of England, *when* the threshing and dressing are done by hand (which is but rarely the case), the work is generally put out to the labourer; and the current price now paid for threshing and dressing and delivering it measured into sacks is 3*s.* per quarter for wheat and 2*s.* for barley: when in bad condition a higher sum is of course paid. The cost would be about the same if the farmer employed his own labourers on day-work to perform these operations, as the following statement will show:—

One man will thresh by the flail, on an average, 6 bushels of wheat per day, supposing it to be reaped, and probably not more than 4 bushels if mown; we may therefore safely take 5 bushels as representing the quantity for a fair average day's work. With the assistance of a lad a man will dress that quantity and measure it into sacks in half an hour, supposing the corn to be of an average yield and length of straw, and in fair condition. Assuming the wages paid to be at the rate of 9*s.* per week, to which we must add the extra allowance generally made to men employed on machine work, say 3*d.* per day, or 2 quarts of beer, which is equivalent thereto (this allowance is embodied in all the subsequent calculations in this paper), it gives us a cost as follows for preparing 5 bushels of wheat fit for market:—

	s.	*d.*
1 day, man threshing, at 9*s.* per week, and allowance	1	9
½ an hour, man dressing Boy assisting ditto } and use of machine, say ..	0	3
	2	0

—or 4¾*d.* per bushel. Barley would cost about the same proportion to the charge made when the work is taken as wheat does. In the above case it is assumed that the grain is carted into the barn ready for threshing.

Having in the foregoing statement shown the cost of preparing grain for market by manual labour, I will now proceed to show the cost of doing so by machinery, dividing it into two classes, viz. *horse-power machines*, usually adapted for separating the corn from the straw only, and occasionally having straw-shakers attached,—and *combined machines*, which finish the sample fit for market in one operation. (I have not shown the cost of preparing all kinds of grain fit for market, but taken *wheat* as the example.) The following statement shows the cost of working a 4-horse-power threshing-machine of the best construction one day, supposing it to be the property of the user:—

	s.	*d.*
1 man to feed the machine, at 1*s.* 10*d.*, and allowance ..	2	1
2 men to move the corn to the machine, to untie, and open the sheaves, at 1*s.* 9*d.*	3	6
1 lad to shake and pass it to the feeder, at 6*d.*	0	9
1 lad to put the corn and chaff into the riddle	0	9
1 man to sift the corn, at 1*s.* 6*d.*	1	9
1 man to drive the machine, at 1*s.* 6*d.*	1	9
(A boy is sometimes employed for this work, but it is false economy to do so, as it is quite necessary the machine should be driven at one uniform speed to ensure its working properly.)		
1 man dressing and sacking 25 quarters (which is the quantity this machine is estimated to do per day, as I shall take an opportunity of explaining shortly), 2 days, at 1*s.* 9*d.*	3	6
1 boy assisting ditto, 2 days, at 9*d.* per day	1	6
Total cost of manual labour per day	15	7

(I do not estimate the cost of stacking or loading the straw, as that can scarcely be included in the cost of *threshing*, and depends entirely upon circumstances.)

I find it rather difficult to give the cost of the horses, as that is a matter upon which a great many different opinions are entertained. The cost to the agriculturist employing his own horses at this work is a very different item to what it would be if the same had to be *hired*, or if the work had to be done in the vicinity of large towns, where the keep is dearer than in rural districts and horses more in demand. I have consulted a number of practical men on this point; their opinions lead me to conclude that, in fixing 3*s.* as the cost per day of each horse to the farmer, I shall not be far wide of the mark. Owing to its being necessary to change the horses at intervals of 2 hours, or thereabout, throughout the day, in order to keep the machine in full work it will require 8 horses, which, at 3*s.* per horse, gives the cost of horse-power as 1*l.* 4*s.* per day. The other expenses are,—interest on the purchase-money of the machine; depreciation in value; cost of repairs, and all necessaries required for working it. In order to arrive at what the cost is in these particulars, I have consulted several agriculturists having similar machines at work, and for these three items I find an average cost of 2½*d.* per quarter, or, taking 25 quarters as a fair day's work, 5*s.* per day. Therefore,—

	Per Day. £.	*s.*	*d.*
The manual labour being	0	15	7
Cost of horse-power	1	4	0
Wear and tear, depreciation in value, interest, &c. ..	0	5	0
Shows the total cost per day of working a 4-horse-power threshing-machine to be	£2	4	7

—or, in round numbers, 2*l.* 5*s.* per day.

The work a machine of this description and power is capable of performing per day will, as a matter of course, vary considerably, according to the length and condition of the straw, and the proportion of the corn to the straw; but 25 quarters per day is considered a fair average day's work; and as the total expense of working it for one day has been shown to be 2*l.* 5*s.*, it gives the cost of preparing grain for market by a horse-power threshing-machine and manual labour combined as 1*s.* 10*d.* per quarter, or 2¾*d.* per bushel.

Having thus ascertained the cost of preparing grain for market by manual labour and horse-power, it remains for me to show what the cost will be if steam-power is employed for that purpose. I will take as an example the "portable finishing, threshing, and dressing machine" described herein, and suppose it to be worked by an 8-horse-power portable steam-engine of the best construction, taking it for granted that this engine and machine are worked by competent men, who will not subject them to undue wear and tear (a very great deal depends on this being the case, as experienced hands will with proper management save a large percentage in the cost of repairs). To put the matter in as clear a light as possible, I think it best to give two separate statements,—one to show the cost to an agriculturist *hiring* an engine and machine of the description I have just alluded to, and the other the cost if he *bought and worked* such an engine and machine as his own property. The cost of *hiring* an "eight-horse-power portable steam-engine and portable finishing threshing and dressing machine," the owner finding proper men to feed the machine and drive the engine, is 1*s.* per quarter: in some districts 10*d.* and even less is paid. This apparatus should thresh and dress at the rate of 40 bushels per hour, or say 50 quarters per day. In making any calculation as to the quantity this apparatus will thresh and dress, it should be borne in mind that it will vary materially with the proportion of the straw to the grain, and the quality and condition of both, the same as in the case of the flail getting through a much larger quantity when reaped than when mown, but I am confident the quantities I have stated are rather below than over the average.

	£.	*s.*	*d.*
The hire of the machine and engine will therefore be 2*l.* 10*s.* (50 quarters, at 1*s.* per quarter)	2	10	0
Coals to be supplied by the user, say 6 cwt., at 20*s.* per ton	0	6	0
Wages to the following men, who are required for working the engine and machine, in addition to the engine-driver and feeder :—			
2 men on the stack, at 1*s.* 6*d.*, and allowance ..	0	3	6
1 man or 2 lads on the machine to untie the sheaves, and allowance	0	1	9
2 men to remove the straw, at 1*s.* 6*d.*, and ditto	0	3	6
1 man to remove the sacks as filled from the machine	0	1	9
1 lad to remove the chaff	0	0	9
1 lad to remove the short straw, cavings, &c. ..	0	0	9
6 horses, ½ day, moving the engine and machine, at 3*s.* per day, and ½ day 1 horse fetching water ..	0	10	6
1 lad to fetch water and make himself generally useful	0	0	9
Making the total expenses per day ..	£3	19	3

—which, assuming the apparatus to do 50 quarters per day, gives the cost of preparing 1 bushel of corn for market by a hired steam-power apparatus as about 2⅜*d.*

Having seen by the foregoing statement the cost of preparing grain for market by means of a hired steam-power apparatus, I will now proceed to the second example, but would first state that, in order to draw a fair comparison between the cost of preparing grain for market by a horse-power machine and manual labour combined, and by a steam-power apparatus, the calculation should in both cases be based on the cost of machines the property of the user. It is difficult to state what size an occupation should be in order to warrant the occupier in investing a portion of his capital in a steam-power apparatus: it is very rarely that an engine and machine are used *exclusively* for threshing out its owner's crops; and when worked for hire, as in the majority of cases they are, the size of the occupation is, of course, a matter of no moment; but there can be no doubt that upon any occupation having 700 acres of land, of which 350 acres may be assumed to produce corn yearly, such an apparatus as I have alluded to herein may be employed to advantage, for on a farm of this extent there are a variety of other kinds of work besides threshing and dressing for which the engine could be used, such as cutting chaff, grinding, pumping, and in some cases working a sawing apparatus, to say nothing of application as a motive power for working the different imple-nts used in the field, for which we may reasonably expect it l ere long be employed; and we may safely conclude that all operations, threshing included, it would be employed at st one day per week throughout the year. The first cost of a d 8-horse-power portable engine and finishing threshing and ssing machine would amount to about 350*l.*,* and the interest that sum for one year, at 5 per cent., would be 17*l.* 10*s.* I ve taken pains to ascertain the average cost of keeping a well-nstructed engine and machine in proper repair and good rking order for twelve months, including a renewal of the arings, spindles, furnace bars, a proper supply of oil, tallow, d all other necessaries, and find that with due care it ought not, leed would not, exceed 25*l.*; and I think the sum of 25*l.* will rly represent the annual depreciation in value. Now, if we l the foregoing sums together as follows, viz.—

	£.	s.	d.
Interest on purchase-money	17	10	0
Cost of renewal of working parts, oil, and other necessaries	25	0	0
Annual depreciation in value	25	0	0
It gives the cost per year of working the engine and machine	£67	10	0

and supposing the quantity of corn grown on an occupation of size before mentioned would, on an average, amount to 25 shels per acre (it is scarcely necessary for me to observe that quantity of corn grown per acre will vary very considerably), total produce for the 350 acres would amount to 8750 shels, or, in round numbers, 1100 quarters annually, which we y estimate as furnishing at least 20 days' work for the engine. e engine is supposed to be employed for all purposes 52 days the year; we must therefore make a fair division of the annual pense, and debit only that portion of the 67*l.* 10*s.* to the cost preparing grain for sale which it ought to bear. The propor-nate charges on the *engine* would be as follows:—

	£.	s.	d.
Interest on cost, 240*l.*	12	0	0
Expense of renewal of wearing parts, say one-half ..	12	10	0
Proportion of depreciation in value, two-thirds of 25*l.*, say	17	0	0
	£41	10	0

ow, if we debit the threshing and dressing process with the part of this sum of 41*l.* 10*s.*, being the relative proportion borne by the days the engine is employed in threshing to the whole number of days it is at work, it will give us 16*l.* as the share of the cost of working the engine to be put to the account of threshing, &c. Referring back, it will be seen at a glance that 26*l.* is the cost of working the threshing-machine, making together a sum of 42*l.* as the cost of working the engine and threshing-machine 20 days, or 2*l.* 2*s.* a-day. The account then stands as follows:—

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* If this sum should seem too low for the price of the best makers, it may be ted in reply that the leading firms have recently made a reduction in their ces of 10 per cent.

	£.	*s.*	*d.*
Proportion of current expenses per day	2	2	0
Coals consumed by engine, 6 cwt., at 20*s.* per ton ..	0	6	0
1 man to drive the engine	0	3	0
1 man to feed the machine	0	2	6
2 men on the stack, at 1*s.* 9*d.*	0	3	6
1 man or 2 lads on the machine to untie the sheaves	0	1	9
2 men to remove the straw, at 1*s.* 9*d.*	0	3	6
1 man to remove the sacks as filled from the machine	0	1	9
1 lad to remove the chaff	0	0	9
1 lad to remove the short straws, cavings, &c.	0	0	9
1 lad to fetch water and make himself generally useful	0	0	9
Giving the total cost per day as	£3	6	3

And as this apparatus will thresh and dress at the rate of 50 quarters per day, it gives the cost per quarter as just 1*s.* 4*d.*, or 2*d.* per bushel. We will now compare these results as follows:—

	s.	*d.*
Cost of preparing grain (wheat) for sale by manual labour, per quarter	3	0
Horse-power and manual labour combined	1	10
A steam-power apparatus, hired	1	7
A ditto ditto, the property of the user (not let out for hire)	1	4

—by which it will be seen that the saving effected in employing a steam-power machine is just 27½ per cent. as compared with the horse-power machine, and 50 per cent. on the cost of the flail. It may not be out of place to call attention to the fact, that when the steam-power apparatus is let out on hire — even supposing it never went above three or four miles, *i. e.* nine or sixteen square miles round the owner's house, and that it was only employed by a small proportion of the occupiers within that space — the cost of preparing its owner's crops for market would be materially reduced, as this arrangement would, in effect, spread the standing expenses of the engine and machine over the work of several joint owners.* The custom, now becoming very general, for a landlord to purchase an apparatus of this description, and let it out to his home tenants, is undoubtedly the most economical. It may also be urged that the advantages attendant on the employment of a steam threshing apparatus are not confined merely to the saving in the money paid out of pocket for preparing the grain for market; the immense saving of time is another and a very important advantage, enabling the farmer to avail himself of a favourable turn in the market at a very short notice. A finishing steam-power apparatus, it is calculated, will perform in *one hour* what it would take two men just *one week* to accomplish; also, the corn not being left about, there is not the same liability to its being wasted or stolen. I have not thought it necessary to treat on the different motive powers in full detail, as such would scarcely come within the scope of this essay; and for information on this subject I cannot do better than refer interested parties to an essay by Mr. W. Moorshead, published in the last volume of the Journal of this Society; nor is it necessary to occupy any length of time in describing the *fixed* threshing and dressing machinery, as it is essentially the same in principle as the *portable*, and is not in any way cheaper or better: it may perhaps be more compact, and possess advantages in the case of large resident proprietors farming extensively, and has been adopted by many landowners in the West of England; amongst others, by His Grace the Duke of Bedford, at Endsleigh; J. W. Buller, Esq., M.P., at Downes; J. G. Newton, Esq., Bridestowe, &c. &c. It will be gathered from what has been previously advanced herein that I do not consider the horse-power threshing-machine can well be altered, so as either to add to its efficiency or reduce the first cost; but as the steam-power apparatus is of more recent introduction, and contains a different class of materials, further improvements in it may reasonably be expected, and I have endeavoured to point out those parts most open to improvement.

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* Deducting one-fifth of the land for meadow and pasture, and adopting a very low estimate of produce, the corn land within the small circle indicated by the author might employ a steam-engine from 150 to 200 days.—ED.

With respect to the first cost of this machinery, speaking first of the " engine," our experience tells us that the principal factories devoted to the manufacture of " portable steam-engines," expressly adapted for agricultural purposes, have within the last few years taken a very high stand; and, for the amount of capital invested, talent employed, and mechanical facilities brought to bear on any one particular branch of manufacture, may be favourably compared with the oldest and most noted engineering establishments of this country. It may therefore be assumed that any material reduction in the price of these engines must depend on a proportionate reduction in the cost of labour and materials; but I am not prepared to say so much as this with respect to the manufacture of the " combined machines," which are constructed of very different materials, and produced by quite a different class of workmen; the weight of many of the working parts must be considerably reduced, and this will have the effect of not only lessening the power required to work them, but also of reducing the cost both to the manufacturer and to the user. The substitution of wood (hornbeam, I believe) for the bearings instead of brass in most of the best machines answers exceedingly well, as the friction is much reduced, the bearings work easier, and last considerably longer. In machines bad in principle, or containing inferior workmanship or materials, the cost of repairs forms a heavy item; and, even if the machines are the best that can be produced, they will soon get out of order in the hands of inexperienced, careless, or prejudiced workmen. In the case of "portable steam-threshing machines" it is essentially necessary that care should be taken by those employed to work the same to keep the bearings properly (not lavishly) oiled and clean, for if these parts are not well attended to, with the great strain on them, they are sure to wear up very fast. It is a very prevalent idea amongst agriculturists that it is necessary to employ an *engineer* to work a portable steam-engine; but such is not the case, as any farm-labourer of ordinary capacity, with the aid of a little instruction from an experienced hand, such as most manufacturers send out to start their engines and machines, would be found quite capable; and any man who has been used to working horse-power threshing-machines would very soon learn to work steam-power machines to the best advantage; it is, however, quite requisite that employers should satisfy themselves that the persons to whom they intrust the management of an engine and machine are masters of the work, and capable of getting over any little difficulty that may arise, before it is left entirely to them. More might be said with respect to the expense of repairs in working threshing-machines and the diminution of the first cost; but I trust sufficient has been said herein to direct attention to those parts in which improvements must be effected before anything like perfection is attained; agriculturists, however, will find it to their interest in the long run to procure these apparatus from manufacturers of good reputation, to whose interest it is quite as much as the user's to supply machinery as little liable to get out of repair as possible, simple yet effective, and at a reasonable price.

It would be difficult to give any satisfactory reasons why the different operations required for preparing grain for market should not be combined in one machine, even bearing in mind how many small farms are to be found throughout the West of England; indeed, the smallness of the farms is rather a reason for than against combining as many operations as possible, and performing the same at one time, by the machine. In consequence of the small staff of labourers at his command, it must suit the small farmer better to finish 30 quarters per day than only to thresh 60 quarters, because it requires fewer hands at the same time; it is, however, a general principle, not altered under any circumstances, that wherever steam-power is employed the greater the number of operations performed at one time the greater the economy: taking, for instance, the employment of a portable threshing-machine worked by steam-power, the cost is but little less for the motive-power, whether it be employed working a machine that threshes only, or one that prepares the corn for market; in fact, the economy of employing steam-power is *far* greater in proportion in working a finishing-machine than an ordinary threshing-drum; and, supposing a farmer to be in a position to purchase or hire a finishing-machine, he will not require to invest money in such machines as are required for preparing the different kinds of grain for market after it is *threshed* by a machine. Although the demand for finishing-machines has considerably increased of late, many good judges and persons whose opinions carry weight maintain that the machine which prepares the corn for the finishing dressing-machine is more useful than the finishing-machine; but this depends very much on circumstances; and if we bear in mind that the first cost of either apparatus is about the same, the cost of working them as near as may be alike, it must be an advantage, provided the grain *is* thoroughly dressed, to complete the process in one operation; and when the grain is required for immediate sale the superior advantage of the finishing-machine is manifest.

Having thus considered the merits and demerits of the various "threshing-machines" in use, and ventured to express an unbiassed opinion respecting the relative advantages of such as are held in the highest esteem, it only remains for me to draw this essay to a close; and if by the facts stated herein the attention of manufacturers is called to the necessity of further improving their machinery, with the especial view of adapting it to the size and nature of the occupations common in the West of England, I trust that the aim of this Society in offering a prize for an Essay on the "Threshing-Machine" will be attained.

[NOTICE.—The Journal Committee cannot fail to offer their acknowledgments to the two Stewards of Implements for the attention they have bestowed on this Essay, with a view to insure the accuracy of the calculations contained in it, and its correspondence with practical work in the West of England. One of those gentlemen, being the proprietor of 5 engines constantly on hire in the West, may be accepted as no bad authority.—ED.]

IX.—*The Labourer.* BY EDWARD SPENDER, of Mannamead, Plymouth, and T. W. P. ISAAC, of Northgate-street, Bath.

PRIZE ESSAY.

CHARLES V., in the monastery of San Yuste, was taught a lesson which he had failed to learn while lord of that vast empire on which the sun never set. He was accustomed, says the historian,* to pass his time in the examination of machinery; he took special interest in the construction of clocks, and endeavoured to make several of these keep the same time. Failing in his attempt, he exclaimed at the folly with which he had all his life sought to coerce men into the same way of thinking.

We have not forgotten the moral of this tale while treating on the condition of the English Labourer. We have borne in mind that man is in himself a complex being, infinitely more so than the most elaborate piece of mechanism; and that further, no two men are absolutely alike. Hence we have laid down no infallible rules by which all ills are to be cured, and a perfect result obtained. We do not believe in any such rules; but hold rather, that, as the evils are numerous and diverse, the remedies must be numerous and diverse also.

These evils affect the Dwelling, the Pay, and the Education of the Labourer. And if it should happen that in dealing with these subjects, each should appear in turn to be not only important, but of superior importance, the seeming paradox will be explained by the principle to which we have just alluded.

Before proceeding to discuss these points, it may be well to consider briefly a few statistics which will enable us better to form an estimate of the population of the West of England. Taking the four counties Somerset, Dorset, Devon, and Cornwall, we find from the census:—

County.	Area in Square Miles.	Area in Statute Acres.	Population in 1851.	Number of Persons to a Square Mile.
Somerset ..	1636	1,047,220	443,916	271
Dorset	987	632,025	184,207	186
Devon	2589	1,657,180	567,098	218
Cornwall ..	1365	873,600	355,558	259
Total ..	6577	4,210,025	1,550,779	..

And the number of inhabitants to the square mile for the four counties is 233.

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* See Stirling's 'Cloister Life of Charles V.;' also Robertson's 'History.'

The character of the population as respects their pursuits will be seen from the following Table :—

Occupation.	Somerset.	Dorset.	Devon.	Cornwall.
Farmers	8,653	3,016	11,964	8,065
Farm-labourers	45,712	23,116	54,235	27,199
Total engaged in agricultural pursuits	54,365	26,132	66,199	35,264

Hence we find that in

Somerset	one person in	8·1	is engaged in agriculture.
Dorset	”	7·0	”
Devon	”	8·5	”
Cornwall	”	10·0	”
Total for the four counties		8·4	”

The thoroughly agricultural character of the population of the West of England is shown by comparison with the population, 1st, of Staffordshire, where only one person in 19 is engaged in farming; and 2nd, of Lancashire, where only one in 36 is so occupied. But although the culture of the land is so common an employment in the West, that district is by no means devoid of manufactures, which exercise an important influence on the rural population.

The subjoined Table will exhibit the number of persons of both sexes in the four counties who thus obtain their livelihood :—

Manufacture.	Somerset.		Dorset.		Devon.		Cornwall.	
	M.	F.	M.	F.	M.	F.	M.	F.
Gloves	1156	8050	654*	1274*	79	3103	..	..
Lace	368	417	..	..	525	5478	..	..
Silk	355	1696	117	447	69	429	..	..
Woollen Cloth ..	1841	1737	..	..	1586	2498	279	130
Rope and Sail-cloth	813	319	..	..	923	106	445	115
Buttons	..	..	3	680	..	..	..	..

* This includes rope and sail-cloth.

Mines and Quarries.	Somerset.		Dorset.		Devon.		Cornwall.	
	M.	F.	M.	F.	M.	F.	M.	F.
Copper	..	..	..	..	1185	171	15,788	3684
Iron	..	..	..	..	..	..	456	..
Lead	..	..	..	..	997	135	2,674	362
Tin	..	..	..	..	712	6	12,727	1876
Slate	..	..	..	..	..	..	541	..
Stone and Limestone .	570	35	741	7	874	36	..	..
Coal	5274	15	..	..	..	..	..	..

The large number of persons employed in the Cornwall mines, amounting to more than 38,000, will not create much surprise. But we think it is not so commonly known that there are upwards of 8000 women in Somersetshire occupied in making gloves alone; and more than 8500 in Devonshire who manufacture gloves and lace. Now what is the effect of this extensive demand for female labour? It follows as a matter of course, both in this case and in that of the mining districts, that the rate of wages is raised. And, in fact, we find the labourer's pay to be nowhere so low as in the county of Dorset, where there are no mines, and scarcely any manufactures. Here 7*s.* is no uncommon sum for the able-bodied man to receive per week; while in Devon and Somerset 9*s.* or 10*s.* is frequently paid, with an allowance of cider to the value of 2*s.* per week in each county; and in Cornwall 12*s.* was the invariable reply which has been obtained from a large number of correspondents. Yet it is by no means certain that the higher sum is a sign of prosperity. Increased wages are not increased wealth, unless the recipient have been taught to make good use of his superior advantages. Without such education, the additional 3*s.* or 4*s.* seems rather to injure than benefit the labourer, since it only affords him a greater opportunity of indulging his sensual appetites.*

There is another point to be considered. We have seen the effect of mining upon the pay of the agricultural labourer. How is his condition affected by the employment of his wife and daughters in various manufactures? We scarcely think favourably. For where it happens that the women of the house are engaged the whole day in other than domestic duties, the father and the sons must fare badly, and will, from the absence of comfort at home, be driven to the beer-shop. Moreover the confinement and restraint consequent upon such employments as glove and lace making, must necessarily act injuriously on the health of those engaged in them. This is specially evident in the case of young female children employed in gloving. Nor is this all. Experience tells us that the morals of those who are thus occupied become impaired. Our readers will have no difficulty in applying these general remarks to particular instances.

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* The Rev. Henry Moseley, Government Inspector of Schools, will support this conclusion. He writes:—"The earnings of these men [the miners of South Staffordshire] were at the time of my visit probably greater than those of any equally large body of workmen in the kingdom. . . . These men and their families, notwithstanding, live in more squalid and miserably dirty and worse-furnished abodes; their children appear worse clad and more neglected; their wives more slatternly and poverty-stricken; and about each of them fewer appliances of comfort, and fewer sources of happiness, have been collected than I have observed in respect to any other labouring population. The country, not less in its moral than in its physical aspect, appears scorched up; and as I have stood at night on some of the surrounding eminences, and seen it extending beneath my feet like one vast and multitudinous city, lighted up by unearthly flames, and sending up from all parts great volumes of smoke and other than earthly sounds, I have been unable to separate in my mind this prospect from the impression that I have received of the condition of the people who inhabit it."—*Minutes of Committee of Council on Education, for* 1846, vol. i. p. 177. These forcible remarks are supported by Mr. Tremenheere, who, in his Report for 1850, writes of the same district: "The distinguishing feature at the present moment unquestionably is, that, as regards the labouring classes, the half-savage manners of the last generation have been exchanged for a deep and almost universally pervading sensuality." This is further confirmed by the Rev. J. P. Norris, in his Report for 1852, where he says: "*Improvidence* is too tame a word; it is *recklessness*;" while he argues "that any improvement must proceed from within rather than from without."

With regard to country mechanics and artisans, they are commonly better educated and more intelligent than the agricultural labourer. This arises partly from the fact that the child of the artisan is not so early taken from school as is the child of the farm-labourer. Also the work of the former requires more judgment, and is less purely mechanical, than that of the latter. This fact has a marked influence on the character of the workman; it makes him more ready to reason and reflect, to exercise his common sense with respect to the different circumstances that are brought under his notice.

What we shall presently say in behalf of better dwellings, better education, &c., will apply equally to the artisan as to the farm-labourer; nor do we think it needful again to distinguish between the two.

THE LABOURER'S WORK.

A few remarks suggest themselves on the two systems of day and piece work. And here it will be at once obvious that, if we wish the labourer to be anything more than a mere tool—if we wish him to exercise prudence and forethought, to be conscious of personal responsibility, piece-work must be adopted in all cases where practicable, i.e. in employments of a fixed character, such as hoeing turnips, reaping, mowing, hedging and ditching, paring and burning. Once give the skilful labourer a chance of raising himself above the dead level of the common drudge, and he will put forth all his energies to complete the work intrusted to him. Nor need it be feared that the quality of the work must decrease in proportion as the quantity increases. Any serious failing or imperfection is so readily discerned in agricultural operations, that the slovenly workman has but little chance of escaping the vigilance of the farmer. We are gratified to find that in nearly all of the numerous communications which we have received from the agriculturists of the West of England, the system of piece-work is strongly recommended, and seems to be generally practised.*

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* Mr. Raynbird, in his 'Prize Essay on Measure Work' (Royal Agricultural Journal, 1846) has enumerated the various advantages of piece-work that arise both to the labourer and the employer.

THE LABOURER'S PAY, WHETHER IN MONEY OR IN KIND.

It is by no means certain that the system of the payment of wages in kind is entirely bad. It has its supporters, able and practical men who have much to say by way of argument, and much as a matter of fact, in favour of their view. It is urged by paying wages in kind the labourer is spared the retail dealer's profit, for it is clear that, if a baker sells flour, he must charge something more than cost price in order to obtain a livelihood. Now the farmer in paying his men in grain rarely seeks to gain thereby, and thus the labourer is saved so much per cent. on the articles of his food. There is another argument which deserves attention. If the farmer supplies his workmen with necessaries they are not compelled to lose valuable time in going to the nearest market-town; and hence, too, they are spared many of the temptations which so peculiarly beset the agricultural labourer in large towns. The master is no less a gainer by this system. In times when grain is high it will happen that he has to pay his servants more than the ordinary rate of wages. But this temporary loss occurs when he is best able to bear it. On the other hand, when grain is plentiful, the farmer pays the men less than the ordinary rate of wages; and thus reaps a benefit when economy is most needed. While, it is further argued, is it not better that the labourer should not be subject to fluctuations of price for which he is not prepared? To all this we reply, your arguments tend to make the labourer an irresponsible being. Strength of character does not consist in security from temptation. A man is not taught to be provident by being deprived of all power to be improvident. Moreover it is not well that any one man should be so completely in the power of another, as the labourer would be in the power of the land occupier if all his wages were invariably paid in kind. Too frequently this system creates the very evils which it is supposed to remedy, since in the West of England large quantities of cider are given in lieu of money. On this point we shall presently dwell more fully.

After careful deliberation it would seem that by far the best mode of payment is to give the labourer *all* his wages *in money*, and it ought to be clearly understood that the purchase from his employer at cost price of such articles of food as he may require shall be entirely optional on the part of the labourer. This opinion is entertained by many of our correspondents, amongst whom we may mention Sir Stafford Northcote; Mr. Henry T. Mudge, of Paignton; Mr. Gabriel Poole, of Bridgwater; Mr. Tindall Harris, of Egham, Surrey; Mr. Gregory, of Street, Somerset; and many other gentlemen who have kindly favoured us with their opinions on this and similar questions.

THE RATE OF WAGES.

The current rate of wages is not a matter of great certainty, since it differs with the season, and also not unfrequently year by year. So far as we can judge from the information which we have received through a large number of correspondents, the following Table will pretty accurately represent the amount paid in wages throughout the different counties of Cornwall, Somerset, Devon and Dorset.

Cornwall.—Weekly wages, 12*s.*; but where the labourer is hired by the year or for any great length of time he receives 9*s.*; little cider is given; hoeing turnips twice, from 8*s.* to 15*s.* per acre; reaping, 2*s.* 6*d.* to 3*s.* per day with board and cider.

Somerset.—Weekly wages, 8*s.* to 10*s.* with cider 3 pints per diem, at from 6*d.* to 10*d.* per gallon, according to the season and the crop; hoeing turnips twice, 10*s.* to 12*s.*; reaping, 5*s.* to 7*s.* per acre, with 2 gallons of cider; mowing, 2*s.* to 3*s.* per acre.

Devon.—Weekly wages, 7*s.* to 8*s.* in North Devon; 8*s.* to 10*s.* in South Devon. A large quantity of cider is commonly given, amounting to 3 or 4 pints ordinarily, but in harvest this sum is increased to, in some cases, 8 quarts per acre; hoeing once, 4*s.* to 5*s.* 6*d.*; reaping, 4*s.* 6*d.* to 6*s.* per acre, with 6 to 8 quarts of cider; mowing, 2*s.* 3*d.* to 2*s.* 6*d.* per acre.

Dorset.—7*s.* weekly wages; the practice of cider payments does not appear to prevail to the same degree as in Devon and Somerset.

It will at once be seen that Cornwall ranks highest in the amount of wages paid—that Somerset comes next in order, then South Devon, followed by North Devon, while Dorset brings up the rear. It is not uncommon for the labourers of North Devon to remove to Cornwall, where they may gain larger earnings. Somersetshire stands about on a par with Wiltshire—while Cornwall is equalled only by those parts of Gloucestershire which lie immediately in the neighbourhood of Bristol.

PAYMENT OF PART OF THE WAGES IN CIDER.

There is one peculiarity in the payment of wages prevalent in the West of England (Cornwall excepted) that must be regarded with strong feelings of regret; we allude to the payment of a portion of the wages in cider. We desire to approach this question with all due deference to the opinions of many practical men, who regard this custom in a different light. The subjoined tabulated returns* on this subject are the results of extensive information which has been kindly placed at our disposal by Mr. J. H. Cotterell, surveyor, of Bath.* It will be seen that the opinions of a large number of practical farmers well known in their respective neighbourhoods are given on the cider question as affecting the West of England. We believe a candid examination of these opinions will corroborate the remarks of Mr. Acland in his 'Farming of Somerset,' page 98, in which he says:—

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* See Appendix.

> "The fact is, the masters and men play into each other's hands, the women and children suffer, and the men too in the long run. The labourer in a year takes off his master's hands about 2 hogsheads of cider, and satisfies one of his own bodily appetites at the cost of 15 per cent. of his earnings.† The liquor refreshes and stimulates him, but wears him out, for common cider is not nourishing, but exciting like spirits and water. West-Country labourers will never be what they might be as long as this system goes on."

In many of these returns it is presumed that the labourer would object to receive money instead of cider (Nos. 22, 23, 24, 25, 26, 27, 33, and others). This perhaps arises from the fact that he frequently does not get a sufficient money equivalent (No. 30). Where the full value of the cider is given, the experiment of paying the wages entirely in money appears to have succeeded (Nos. 1, 2, 3, 4, 9, 11, 21, 40, 41, 44, 45, 47, and others). In addition to the information contained in our Appendix we may refer to the experience of Mr. Danger of Huntstile, as given by him in Mr. Acland's 'Farming of Somerset,' and quoted in the last volume of the Society's Journal.

Whilst speaking on this subject we will allude to a kindred one—the "Harvest Homes"— which, instead of being the times of innocent enjoyment and rejoicing, such as the poets have sung, are frequently a season of drunken revelry. We are glad to see that a better system of celebrating the ingathering of the harvest has undergone much discussion in Herefordshire. Mr. Booker Blakemore, M.P., and the local clergy, are actively heading this agitation. Their scheme involves a reform of the general condition of the labourer.

> "It has hitherto been the custom in this county for the farmers to pay their workmen partly in money and the remainder in cider, and the keeping of 'Harvest Home' consisted in an unlimited supply of the famed beverage of the district, which always led to rioting and drunkenness, and in some cases even to loss of life in these bacchanalian orgies. It is now proposed to abolish the system of paying the labourers partly in cider, and substitute for the Harvest Home drinking bouts parochial tea-parties for the men with their wives and families; and the subject, having been taken in hand at all the recent agricultural meetings in the neighbourhood, is gaining much in favour, and seems likely to lead to a large measure of social reform."

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* This information has been collected by him at considerable labour and expense.

† Our returns show the percentage to be nearer 20 than 15.

It is well known that the same question has been very successfully agitated in Norfolk under the auspices of the Earl of Albemarle and other benevolent and influential persons, where the whole inhabitants of the parish (including wives and children, so often forgotten at labourers' merry-makings) join in a festival where bread, butter, and meat, coffee and tea form the bill of fare. At such meetings as these, the rector, and the squire, and the farmers, with the ladies of their respective households, find it a great pleasure and privilege to attend, and that healthy feeling of mutual confidence and respect which should exist between all classes of society, has been promoted and extended—

"When none was for a party,
And all were for the State;
And the great man helped the poor,
And the poor man loved the great."

Since this Essay was first written Somerset has followed the example of Hereford and Norfolk. Archdeacon Denison last year tried the experiment of the Parochial Harvest Home, and with complete success.

THE MEANS OF FITTING THE WORKMAN FOR HIS CALLING IN LIFE; DISTINGUISHING SCHOOL EDUCATION AND EDUCATION IN HIS WORK.

No man needs to be told that he is poor. Poverty is a very sensible evil, and makes itself felt every hour. It is not thus with ignorance; only the educated man can fully appreciate education. The untaught labourer will be content to "make his mark" in the parish register, or on a receipt, and the inability to write his name will not cause him one moment's regret or shame; or if he should be able to write, and even to draw out a bill or an estimate, he will be perfectly satisfied though his orthography should be as eccentric as the Phonetic system itself. The demand creates the supply, political economists tell us. From this proceeds the first great difficulty that meets all those who are desirous of spreading education among the working-classes. It is evident that before we can expect education to become general, we must excite the wish for it. The parents, themselves uninstructed, must be taught to covet for their children that, the advantages of which they have never yet comprehended. When we have once excited this interest—either by shewing that the children are more likely to "better themselves" if only they have received a little "scholarship," or else by the amusement derived from the reading of entertaining books during the long winter evenings—then we are able to lay down a first principle that, except in rare cases,* *no education should be*

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* These rare cases are met by the institution of Ragged Schools.

gratuitous, that parents must pay for the training of their children, and at the same time have some control over the management of the school.*

What costs nothing is nothing valued; while that which makes demands upon the purse naturally excites the attention.

This principle must, however, be accepted with a qualification. We can hardly expect that the labourer with a "wife and seven children," whose united earnings are but 7*s.* to 9*s.* per week, should be able to lay by for anything which is not absolutely necessary to support the bodily wants.

> "If," says the Rev. Frederick Temple, "the labourers of this class are to educate their own children, without help either from Government or from private charity, they can be enabled to do so only by a rise in wages."

We learn, farther, from the same source, what this rise must be.

> "The four counties of Cornwall, Devon, Dorset, and Somerset, may serve as a specimen of the needs of education among a rural population. In the schools under inspection in these counties the annual expenditure per scholar is 18*s.* 3¾*d.*; the grants from Government average 11*s.* 2¼*d.* The total cost, therefore, of educating a child is 1*l.* 9*s.* 6*d.* Of this sum the parents pay at present 4*s.* 6*d.* If we take the school year at 45 weeks, the school fees would amount to little more on an average than 1*d.* a-week. It is, no doubt, possible that this might by judicious treatment be a little increased, and we may suppose it raised to 2*d.* a-week, or 7*s.* 6*d.* a-year. There still remains 22*s.* to be provided; and as the average number of children in a family is certainly above 2, and perhaps 3, we must suppose wages increased by 66*s.* a-year, or about 1*s.* 3*d.* a-week. But such a rise would not do what is needed; there are many most pressing demands which would take precedence of the children's schooling. The wages are so close upon the imperative requirements of nature that any increase would be largely and most justly absorbed in better food, warmer clothing, especially at night, and more comfortable dwellings. If, indeed, the parents could distinctly see the future welfare of their children to depend on education, they might purchase it with much present self-denial. But the education is visibly a gain; it cannot be called in that class a necessary to life. Manual labour does not and cannot much depend on reading and writing; and the great mass of the children of the labouring class will have to live by manual labour. Parents of this class rarely see an instance of education visibly and unmistakeably influencing success in life, and to a rare chance they cannot be expected to sacrifice much. It is probably a very moderate computation that, in order to obtain 1*s.* 3*d.* per week from the parents in the rural districts, their wages must rise 2*s.* 6*d.* a-week, and this rise, of course, must be universal. To wait for this is to wait indefinitely."—*Oxford Essays*, 1856.

There is a great difference between Instruction and Education. The teaching of the present day has hitherto partaken too much of the former, or, in other words, we have been too intent on teaching by rote, or cramming the memory with that "rudis indigestaque moles" of "useful knowledge," which of all knowledge is the most useless. Education, on the other hand, is the drawing out (as the name implies) of existing faculties.* "Useful knowledge" deserves its title only in proportion as it brings these powers into use. Any particular subject, when pursued for its own sake, is so far merely a branch of Education; but when it is pursued under the idea that thereby the powers of the mind will be exercised, then it becomes a means of Education.† The acquaintance with any science is but a matter of secondary importance when compared with the influence it may have had upon the judgment, the faculties of reflection and abstraction, and, above all, on that faculty of applying the knowledge so gained, a faculty which we recognise as "Common Sense."

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* These two points, viz. the obligation incumbent on all parents to pay the real cost of educating their children, and their consequent claim to take a part in deciding what that education shall be, however startling to some of our readers, are not suggested for the first time by the writer of this Essay. They involve a principle which may some day force itself tangibly on public attention.—Ed.

The infant pupil must necessarily to a great extent be content to learn by rote. But when the boy leaves the day-school for the field, he ought to have been so taught that he shall not in two years forget all that he has been learning for six; and yet how often does it happen that the lad of sixteen knows no more than the child at six. To prevent so lamentable a consequence we cannot too strongly insist upon the great value of evening and adult schools, for keeping up an interest in learning. The teacher should not be so much the master as the fellow-learner of those under his control. The teaching, moreover, should not partake so much of the Lesson as of the Inquiry. If the spirit of investigation has been once excited the labourer will have a thousand questions to ask. His daily duties will suggest these questions:—The causes of heat and cold, rain and dew, the source of the fertilizing qualities of manure, the construction of the steam-engine, the principles of draining, of ventilation, common facts about health and disease, so immensely important, and so little understood—all these, and many other problems he will want to have solved, and all these the teacher should—not solve for him—but help him to solve for himself.

If it is replied "cui bono?" we answer, 1st. What *right* have you to withhold knowledge from your brother? 2nd. It is clearly to your *advantage* that the labourer should be instructed. Grant that, uneducated, he is "the best living tool in the world," do you not sometimes require something more than a tool; do you not often need a head which shall determine how the tool can be applied most efficiently and most economically? Even granting, which we do not admit, that a knowledge of Physics, &c., is not directly useful, it is at least indirectly useful. For anything which tends to exercise the mental faculties, such as judgment, reflection, &c., or the power of acquiring knowledge, and that power of applying it which we term common sense, must be for the benefit as much of master as of labourer. "Ignorance," says Mr. Kay, "is a greater thraldom than oppression, for oppression does stimulate to opposition; whereas ignorance cramps and palsies efforts by concealing the view of the advantages to be gained by industry." (*Social Condition, &c.*) And, says South, "Ignorance is no man's duty, and can be no man's perfection."

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* See Trench 'On the Study of Words,' pp. 174, 175, 7th edition.

† For some forcible remarks on this topic see 'Lecture on Education delivered at the Royal Institution, by Mr. Tyndall, May 27, 1854.' London, J. W. Parker and Son.

A two-fold motive induces the labourer to send his children to school; supposing him to have seen the benefits that result from Education. Honest pride makes him desirous that his own family shall not be behind other children of the same station. He himself never had "much scholarship when he was young," for then "scholarship" was not in vogue; but now the case is widely different, the boy who cannot read or write is below the great majority of his companions.

But besides this feeling of honourable emulation the father sees that education does actually assist in practical work. The child who has been to school is more active, more ready to understand the commands of his employer, more competent to fulfil them; and then beyond all this, it is indisputable that the scholar has far more chance of "bettering" himself than the dunce has. But yet with these inducements, how comes it to pass that such a large number of children amongst the lower classes receive no education at all even in the most limited sense of the word?

From the Educational Census we learn that, while the

Total number of children between the ages of 3 and 15 was	4,908,696
The total of scholars in public and private schools was only ..	2,144,378
Leaving children who do not attend schools	2,764,318
Deduct unable to attend on account of occupation, serious illness, or domestic education	1,245,435
Leaving, who should attend and for whose absence no other reason than parents' pleasure can be assigned	1,518,883
Supposing parents' discretion reasonable under 5 and above 12 years of age, deduct..	550,331
Leaving, who do not attend, and whose absence cannot be explained by absence from home, illness, domestic occupation, or legitimate interference of parents	968,552

That is to say, there are nearly one million of children between the ages of 5 and 12 who receive no education, either public, private, or domestic. When we remember that ignorance is the fruitful source of crime, we may well feel some anxiety as to this state of things, and eagerly seek for some means of remedying so grave an evil. It is very clear that the motives spoken of above do not influence a very large number of parents; they have no desire for the education of their children.[*]

The difficulty which we stated at the outset of these remarks still, therefore, remains to be overcome. We believe that one source of this lamentable indifference arises from the *kind* of instruction that is usually given. The system of teaching too often fails to awaken any interest in the child; and, failing in this first essential, it leaves the child as ignorant as it found him. It also fails in impressing the parents with a conviction of its practical bearing on the real prospects of the child's life. We are asked to distinguish between the School Education of the labourer, and education in his Work.[†] We are disposed to think that the distinction is only too plain, too decisive. Were the difference not so great there would be more of each sort of Education. How can we expect that the labourer who finds it so difficult to support himself and family can dispense with the services of his son, or allow him to go to school, where he is taught uninteresting facts which can be nothing else than burdens on the memory, instead of earning his shilling a week by working up at the farm yonder? The elder daughters, too, cannot be spared; they must stay at home and see after the younger children while the mother is away in the fields weeding or hoeing.

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[*] In the evidence before the Manchester and Salford Parliamentary Committee, 1853, we read:—

"1324.—Do you think the manufacturing poor at all appreciate education generally?

"The Rev. W. J. Kennedy.—Not to the fullest extent to which it is desirable; and to that I attribute the non-attendance of vast numbers of children.

"1325.—Not from any want of means?

"In some cases from want of means. I do not think to any very great extent from want of means. In fact, I have made much inquiry into the subject, and I do not see how it can be, when I find how many people are employed, and what the wages are that they are getting."

[†] The author apparently has not quite apprehended the intention of the suggested inquiry. The education of the labourer differs from that of the scholar in this. The scholar does not begin to work till he is a man, consequently his training during his non-age consists of study and games, the second quite as influential on character as the first, and both proceed simultaneously. When his education in work begins, he is more or less his own master, at any rate he cannot be treated as a boy. The ploughboy's mental training is soon over; as to a game of play, he hardly knows what it is. His master looks upon play as a vice—a sort of robbery: work without study or play is the sole occupation of his youth. It was intended to suggest the inquiry—Is it possible (bearing these hard facts in mind) so to begin the real education of the labourer at school as to put him in a better position to carry on education (moral and mental training) with his work, and even in and by his work? Cannot the period of schooling by any means be prolonged? Cannot school and work be combined, either by bringing work into school, or schooling alongside of working? In the first case, may not work improve the practical character of the book-learning, and tempt the parent to postpone the time of real service; or, lastly, cannot and ought not work, *i.e.* actual service under a master, to be combined with moral and religious training; so that the great end of the labourer's existence on earth, which after all is not only to hew wood and draw water for his master, may be helped forward, and not hindered, by the circumstances in which he is placed by no act of his own? It is not the education of the *labourer* alone which is the real question involved in this inquiry. When shall we all feel that our own circumstances and the circumstances of those around us are not our excuse, but the materials out of which we have to work the work of that Master whose service is perfect freedom?—T. D. A.

The establishment of *Industrial Schools* does, we think greatly tend to supply this deficiency of training. In such schools the children are taught something more than dry unproductive facts, which only encumber the memory; they are instructed in the pursuits which they intend to follow. Many of these schools have been started in various parts of the country, *e. g.* at Henley on Thames, at Forthampton, Gloucestershire, in Herefordshire, Warwickshire, and Worcestershire. The land under cultivation in these instances varies from 16 perch to 9½ acres.

Of the Industrial School at Henley on Thames, the Rev. H. W. Bellairs gives the following account in his General Report to the Committee of Council 1852:—The school was opened in 1849, and the ground attached (177 poles) was divided into 68 allotments, of different sizes, which are let to the boys. When a boy leaves school he is required to give up his allotment. His crops are valued by two of the senior boys, and his successor pays him the full price. Every Wednesday afternoon is devoted to gardening. This is found to be sufficient, as most of the boys come after schoolhours. When their work is over there is an excellent playground (148 ft. by 108) in which they may amuse themselves till dark. Several of the boys reap a profit from the cultivation of their little gardens; and consequently they are very popular amongst both the children and their parents.

Mr. Batson, of Kynastone Farm, Herefordshire, boards

	s.	*d.*
20 boys at an expense for each boy per week of	2	9½
The same are clothed at an expense per week of	1	2¼
Total expense for each boy per week	3	11¾

The ages of the boys are from 9 to 15. The intellectual instruction is given at night; during the day they are employed in "learning to be good and skilful labourers, and to get their own living." Mr. Batson considers that the boys may be made to pay for their own maintenance, and that the system may be carried out successfully.* An institution similar in its object to the above was established at Hanley Castle, Worcestershire. Here young girls were trained as household servants; they were taught reading, writing, the first four rules of arithmetic, plain cooking, to make and bake bread, to wash and iron, get up linen, &c. The terms were 4*s.* per week for clothing, lodging, board, and education, and 10*s.* entrance. This institution was carried on under the superintendence of Lady Darell, but was closed on her leaving Hanley. (*See Minutes of the Committee of the Council of Education*, 1852-3, p. 106, &c.)

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* We regret to learn that this school is no longer in existence. There is a school near Cambridge, in which Mr. Harvey Goodwin takes an active part, where any boy from the town can come and have his meals for a day's work, whenever he wants it. The effect on the ragged part of the population is very remarkable.—T. D. A.

We look upon the establishment of Industrial Schools as one of the most hopeful signs of the age. They bear witness to an earnestness and honesty which insist that, if work be done at all, it should be done well. In this we are returning to the spirit of the "good old times," before shams were taught to counterfeit the truth; and when the greatest preacher of his generation feared not to say from the pulpit, "One can spin, and another can make shoes, and all these are the gift of the Holy Ghost. I tell you, if I were not a priest, I would esteem it a great gift that I was able to make shoes, and *would try to make them so well as to be a pattern to all.*" * And this after all is but a forcible illustration of the duty which the Catechism enforces, that each should strive to "do his duty in that state of life unto which it has pleased God to call him."

THE LABOURER'S RECREATION.

If Recreation be a rightly chosen word, the subject to which it refers must be one of great importance. For consider what re-creation means. It signifies the restoration of wasted powers, the resupplying of exhausted energies; recreation if rightly viewed is not idleness, but education.† "Le changement d'étude," said a great French statesman, "est toujours un délassement;" and the best recreation is change of employment, or the calling into use those faculties, whether bodily or mental, which have not been exercised during the day's work. Our continental neighbours have understood this matter far better than ourselves. Re-creation with them is not a synonym for an unlimited supply of beer. Music and dancing are certainly better amusements than public-house orgies. Perhaps this contrast, so unfavourable as regards our own country, arises partly from the climate which forbids Englishmen the out-door amusements of France. Perhaps, too, the national character, which makes us even "take our pleasures sadly," may have had a considerable influence in bringing about this state of things. But we still think that much of the vulgarity and brutal sensuality, which characterise the relaxation of the English labourer, might be remedied by the land-owners and the land-occupiers themselves.

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* 'Sermons of Dr. John Tauler, translated by Miss Winkworth.' For a further account of this famous divine of the fourteenth century see Vaughan's 'Hours with the Mystics.'

† "As for games of recreation, I hold them to belong to civil life and education."—*Bacon*, 'Advancement of Learning.' See also Fuller's 'Holy and Profane State.'

Some writers, amongst whom is Mr. Kay, have supposed that it is the enclosure of the commons and village greens which has driven the labourer to the beer-shop. We are inclined to question this hypothesis. By the Act 8 and 9 Vict., c. 118, it is specially provided that allotments for the recreations of the poor may be required as the conditions of enclosure of the waste lands. But in many cases where such an allotment has been made the poor do not seem to have availed themselves of it; while there is little question that enclosures generally have a beneficial effect on the morals and habits of the rural working classes. We believe that the secret of the labourer's regeneration lies elsewhere. It is the upper-classes who must produce this change, by mingling more frequently and by showing greater sympathy with their poorer brethren. Judge Talfourd, in those memorable words which were so suddenly cut short by the unsparing hand of Death (truly it was a blessed thing to die whilst giving utterance to such noble thoughts), lamented the estrangement that existed between the various sections of the community; and to this estrangement he traced much of the moral and physical evils of the lower classes. There was an element of truth in the dreams of the "Young England" Party. They were right in regretting and in striving to bring back the "Good old Times," when peer and peasant shared in the same sports. Such comminglings act not merely directly, by shewing the poor that they are cared for by the rich; but indirectly, inasmuch as the rich have thereby an opportunity of inculcating (by practice rather than precept) the great lessons of order and obedience.* A bright example has been set by the Rev. F. D. Maurice, the Rev. Charles Kingsley, and some other gentlemen who have shewn with what beneficial results this union of classes has been attended. The first of these gentlemen in the town, the second in the country, have won the lasting gratitude of many a man, woman, and child, who have learnt to look upon them as the exponents of all that is truest in our common humanity.

But out-door amusements are not the only recreations to be considered. The "mens sana in corpore sano" demands that some provision should be made for mental diversion. Indeed the agricultural labourer, whose work is chiefly active, and whose bodily faculties are therefore pretty fully educated, specially demands that we should offer to him such recreations as shall call into exercise his intellectual faculties.

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* Tasso long ago saw that the higher must set the example to the lower :—

"Da i più sublimi ad ubbidire
Imparino i più bassi."—*Gerusalemme Lib.*, canto v.

"Recreation," says Dr. Acland in his 'Health, Work, and Play,' a pamphlet full of kindly wisdom, and valuable practical suggestions, "is the freeing of the body and the spirit from the strain to which either, or both, are subjected. What is recreation to one man is therefore labour to another, and the student could often do no better than wield the adze or the hammer for a while, and let the body-worn mechanic peruse the works which he had left on his desk." (P. 29.) For that class of the community whose condition we have been considering, Lending Libraries, Mechanics' Institutes, &c., are a great desideratum. Mr. Ewart's Act is an important step in the right direction, and will be found more and more beneficial.

Associations have been formed independently of this Act. One of these, Lord Stanley tells us, comprises 70 affiliated institutions, and has put in circulation from village to village 250,000 volumes. It may be hoped that such efforts will in time interest the working classes in the spread of education, and thus surmount the chief difficulty which exists in the way of its diffusion.

The Hon. and Rev. Sidney Osborne (in 'Meliora,' 1st series) recommends the establishment of coffee-rooms, and which shall unite to the place of refreshment the attraction of a reading-room.* All such institutions he would have well supplied with newspapers, magazines, and books; while the labourer should have full power to order tea or coffee and bread and butter; and beer even should not be refused up to a certain amount, only none should be sold upon the premises. This we think a wise arrangement, since it is founded on the principle that the beer-shop is not to be put down unless we offer some counter-attractions. The bright cheerful fire and the sanded floor, together with the lively companionship of his equals, is too great a source of temptation to afford mere negative measures of reform any chance of success. If these institutions can be made to pay their expenses, which we fear is rather doubtful, a great boon will have been conferred on the labouring classes. It is a forcible remark of Michel Levy's, quoted by Dr. Acland, that "L'Hygiène, ou plutôt la Civilisation, dont elle est une face, se résume en deux mots—Moralité, Aisance." This should be borne in mind when treating of the education and recreation of the labourer no less than when dealing with his dwelling.

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* The difficulty in the way of the success of coffee-rooms is that they are rarely found to pay their expenses.

THE DWELLING OF THE LABOURER.

Public attention of late has been much turned to the improvement of the homes of the poor, and we have to thank 'The Royal Agricultural Society' for the encouragement which they have afforded to a better class of cottages. And though we might multiply evidence on the present bad condition of labourers' dwellings, we are glad to note that their condition is now in many respects superior to that of former years.

Lord Portman, says that—

> "Some of the cottages at Bryanston are good, others bad, but all are improved or being improved."

Mr. T. H. Tilly, of Falmouth, says—

> "The cottages in this neighbourhood are yearly improving."

Mr. John Sillifant, of Copplestone, Devon, says—

> The condition of cottages here is various; on the whole much improved and still improving."

Mr. Robert C. Haydon, of Tiverton, says—

> "The condition of the cottages is very good, being much improved of late years."

Mr. James Ritallick, of Bodmin, Cornwall, writes—

> "Cottages that have recently been built are generally of an improved character, but the old houses are not so convenient."

These facts are certainly encouraging, for we believe that it is in this direction that the first effort to raise the social and moral character of the labourer must be made. Many other excellent reforms depend upon this, and should be contemporaneous with it. Thus Sir Arthur Elton, of Clevedon, says—

> "I doubt whether cottages with proper accommodation would have *much* effect on the habits and morals of the poor, unless something were done at the same time to educate them by means of National and Evening Schools, &c.
>
> "In populous districts especially, the landowner who builds commodious cottages will often find them turned into mere lodging-houses for persons of both sexes, who occupy rooms intended for the labourer's family."

Thus it will seem no paradox to say that, without education, improved dwellings will fail to effect their object, whilst education itself will leave no lasting effect, unless the dwellings of the poor are converted into decent homes.

MANAGEMENT OF COTTAGE PROPERTY, AND BOARDING OF SINGLE LABOURERS.

The labourer who possesses an improved dwelling will frequently sacrifice decency and comfort in order to take in a lodger. The extra shilling a week thus obtained forms an almost irresistible temptation. This is not to be wondered at; and indeed scarcely to be blamed. It is not till education has taught him the importance of habits of cleanliness and decency, that he can be expected to appreciate and make sacrifices to maintain them. Bad as coercive measures usually are, we think it might be one of the clauses in agreements for cottages, that the tenant should not be allowed to take lodgers:—

Mr. J. Y. Marvicar says, in the 'Royal Agricultural Society's Journal,' 1849, that, on the estate for which he was agent, in addition to the customary agreement, the following condition was strictly enforced, viz.:—

> "That no cottage-tenant should take in any lodgers under penalty of forfeiting a quarter's rent for the first offence, half a year's rent for the second, and deprivation of his cottage and land for the third transgression, unless he had first obtained the proprietor's or agent's consent in writing."

We are not at all surprised to find that in enforcing this bill of pains and penalties "considerable difficulty was found" and "great vigilance had to be used." It appears to us that it would be sounder policy to remove the temptations, either by teaching the labourer the full extent of the evil he incurs, or by, what is the more practical plan of the two, the provision of a labourer's boarding-house. Of this latter subject we will speak presently.

The collection of cottage rents is frequently a troublesome and tedious affair. "Oh, you must take the money weekly, or you will never get it," has been the cry. We ourselves, however, have seldom experienced this difficulty. We have nearly always found that the labourer does not require to be treated as a child, and to have his rent taken out of his weekly wages, for fear he will not be able to save the money quarterly. All our cottage tenants are quarterly, and we encourage this arrangement, believing it tends to form habits of providence and forethought. To the tenant who pays punctually we make a small allowance, which those who pay a fortnight after the audit day lose. It is surprising the efforts that will be made to obtain this gratuity. The tenants see it is to their own advantage to pay punctually, and the surest way of obtaining the end in view, either in this or in more important matters, is to make both parties interested in the arrangement. Of course to render this system effective, the payment of any arrears must be firmly enforced, but in the majority of cases the rent will be punctually paid. Repairs are the great drawback to cottage property, and the labourer frequently is not so careful as he might be to prevent dilapidations. It has been suggested that the interest of the occupier might be enlisted in preventing unfair wear and tear. For instance a 4*l.* cottage might be let at 4*l.* 10*s.* a year, and the owner might return the extra 10*s*. in case no repairs were done, or if the repairs were below 10*s*. return the balance. We have not ourselves tried this plan, and consequently are unable to offer any evidence as to its efficiency.

We have now to consider the boarding of single labourers. Little has been yet done in this direction, although, no doubt, much good might be effected by this means. Young unmarried men and lads are those who form the most troublesome and dangerous portion of the country poor. The father's dwelling has become too small to comfortably accommodate the family, and either decency must be outraged by the mixing of the sexes in the same sleeping room, or the older lads must seek lodgings elsewhere. The provision of labourers' boarding-houses seems peculiarly adapted to meet the wants of this class. The principle of association might be introduced, and the lodgers, by forming a "joint-stock company," be enabled to obtain a better dinner than most of their neighbours. The experiment has been tried on a small scale on the farm of Mr. Sotheron, M.P., and we believe with the best success.

Sir Arthur Elton has given, in the 'Bath and West of England Agricultural Society's Journal' for 1856, an outline of an experiment of a similar, but more extended character, at Clevedon. Sir Arthur, however, states that his lodging-house has not been much used by the class for whom it was principally intended.

From what we have said it will be seen that much has been already effected in the improvement of the dwellings of the labouring classes, but more still remains to be accomplished. The evils which exist sometimes arise less from ignorance and apathy, than from the want of sufficient means to remove them. This conviction has called into existence the Salopian Society, which has been established at Shrewsbury under a royal charter, and has for its object the providing improved dwellings, baths, and washhouses for the poor in Shropshire and the adjoining counties. This association numbers amongst its patrons most of the nobility, clergy, and leading men of the district; and, to judge from its board of directors, it is likely to effect a large amount of good. Its capital is 100,000*l*. in 5*l*. shares, with power to increase the same to 300,000*l*. Its founders confidently expect that their undertaking will pay a dividend of 4 per cent.; but as the society has only just commenced its operations, it is impossible to say how far the experiment will succeed.

Would not the investment of money in such objects as the foregoing constitute a most healthy form of charity? The usual pauperising tendency of almsgiving would be avoided, whilst the society would be self-sustaining. We would suggest to the landowners and philanthropists of the West of England, that the establishment in this district of a society similar to the Salopian, with branches at the principal towns, would be productive of much benefit to the labourer. Should this hint be considered of any practical value, we should be very glad to furnish any further particulars bearing on this point. We may state that we have placed ourselves in communication with Jukes Styrap, Esq., M.D., founder of the Salopian Society, and we find from him that the cost of extending the Salopian charter to the West of England would be about 200*l.*, and the probable cost of a new charter 1500*l.*

THE LABOURER'S GARDEN AND THE ALLOTMENT SYSTEM.

In the reign of Queen Elizabeth two important laws were passed, which tended greatly to influence the condition of the lower classes. The one was that famous act by which the pauper of the present day demands as a right that he shall not be left to starve: * the other, an act which, if it had been strictly observed, would very much have lessened pauperism, inasmuch as it provided that no cottages should be erected unless a certain quantity of land was attached to each; and called all dwellings failing in this respect "silly" cottages.

That this law has become obsolete is a great misfortune to the agricultural labourer. That from this cause is derived much of the improvidence, intemperance, and consequent destitution of the working classes, is now becoming generally recognised. To remedy this defect, and to prevent its lamentable results, the system of allotments has been devised, and has been put in practice throughout the kingdom. This system has been in many instances applied to charity lands contiguous to villages; and as these lands are generally isolated, the allotment seems to be the best use to which they can be put, and the best method of carrying out the benevolent intentions of the donor; while the tenant himself is in a better position than if he rented land of a private individual, since trustees are not likely to be so capricious, nor so avaricious, as other landlords.

By the statute 8 and 9 Vict. c. 118, on the Enclosure of Waste Lands, it is provided that portions of the waste shall be allotted for the labouring poor, on which a rent-charge shall be fixed similar to that for the commutation of tithes; and that that sum shall not exceed the net annual value of the allotment at the time of making the same.

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* This Act was not needed before, as the introductory chapter of Mr. Froude's 'History of England' clearly proves.

In addition to this, benevolent individuals have themselves set apart similar allotments; not unfrequently the glebe has been adapted for this purpose. Too much importance cannot be placed on such a procedure. Viewed as a remedial and temporary measure it is invaluable.

> "The possession of a quarter of an acre of garden-ground may, and often will, make to the labourer and his family the difference between want and sufficiency; between privation and comfort; between a contented mind and the cheerful fulfilment of the duties of his station, and a mind soured, hardened, and dissatisfied, prepared to yield to vicious promptings, and to rush recklessly into breaches of the law."—*The Farmer.* Chas. Knight, 1844.

Then arises the question, how much land should be so allotted? The answers are somewhat contradictory.* All the evidence that we ourselves have received from nearly a hundred different sources, coincides in affirming that the allotment should average a quarter of an acre, and should never exceed half an acre.

The cause which has induced our correspondents to restrict the allotment to one quarter (some say as low as one-eighth) of an acre, seems to be the fear which they have that, if more land were granted, the tenant would cease to be a labourer, and become a small farmer. Now, granting that such a result would follow, what evil consequence would arise? Surely there is no law against a man raising himself! If he is in a condition to support himself and family by tilling his own little estate, we have clearly no right to demand that he shall remain a day-labourer.

The effect of the allotment system is manifoldly beneficial. It tends to keep the tenant from the beer-shop, to which he had formerly been driven by sheer ennui. It is the best school of apprenticeship for the labourer's children, while a common object of toil and interest creates a feeling of unity and sympathy. Moreover the children are under the supervision of their parents, and can be profitably occupied without being exposed to the evil influences of the manufactory or the field. And further, as Mr. Helps well remarks:

> "This system might occasionally prevent the sense of an almost unnatural dependence being so much exhibited or felt when the children are employed in some factory and the grown-up people are not."—See *Claims of Labour*, p. 120.

Once more: the *farmer* derives great benefit from this system; for not only does it afford a good training for future efficient farm-servants, but he may often advantageously allot foul pieces of land, which will be best cleaned by the growth of the potato. Spade labour and manure will work wonders on the worst of soils, as every Flemish traveller can testify.

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* As a specimen of this conflicting evidence, we may refer to Mr. Bearn's evidence against the system, as given in his Report on the Farming of Northamptonshire, Royal Agricultural Society's Journal, 1852; and to the facts adduced in favour of it by the author of 'Remedies for the Perils of the Nation.'

However, the farmer is often jealous of the allotment, and believes that the labourer frequently neglects the farm for the garden. This Mr. Bearn states has been the case in Northamptonshire. But the chief practical difficulty arises from the injury that is often done to the land by the want of proper manuring. For instance, there is one parish in Wiltshire where many acres of ground thus allotted have now become little better than a sheep-walk. Stringent provisions should, as far as possible, be made to prevent a result so prejudicial both to master and labourer. To the latter the exhaustion of the ground is a very serious calamity; for there is little doubt that the allotment garden is a source of considerable profit and comfort to him. This supposition is confirmed by Mr. George Nicholls, who, in his prize essay on the Condition of the Agricultural Labourer (Royal Agricultural Society's Journal, 1846), writes as follows:—

> "With a garden of a quarter of an acre the labourer can keep a pig, which the refuse vegetables from his garden will enable him to rear, and nearly to support. He may also keep bees, the value of which is well known to the thrifty housewife."

But all that we have said in favour of the allotment system must be understood with the qualification that this is only a *temporary* expedient. The true method is to attach gardens to the cottages of the labourer. It is important that he shall not have to go far in order to get to his garden. In a changeable climate like ours, it is likewise expedient that, in case of rain or storm, his family shall be able to take speedy refuge within doors. Moreover it is well to invest the abodes of the lower classes with every kind of innocent attraction. If the garden surround the dwelling, how much more cheerful will the cottage be, how much more will the idea of home be associated with it![*]

FRIENDLY SOCIETIES.

The object of Friendly Societies is so good, and the effects which they *may* produce are so beneficial, as to render it of the highest importance that they should be constructed on a right foundation, and that no defects should exist in their management.

It is hardly necessary to allude to the small private, or public-house clubs. It must be evident that such are unsafe, since the law of certainty in uncertainties, in other words the tables of sickness, will not hold good with a less number of members than 500. The improvident tendencies of the public-house club may be considered to far exceed any good that it may effect. The working man is led into temptation, and induced to squander the provision for old age and sickness. The members are frequently compelled by the rules to spend about 3*d.* each for "the good of the house." But this generally represents only a very small proportion of the amount actually squandered. We have frequently been informed that 1*s.* 6*d.* is much nearer the sum.

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[*] We may refer our readers to some very forcible remarks on this subject in Mr. Nicholls' Essay on the Condition of the Agricultural Labourer, Royal Agricultural Society's Journal, 1846, p. 22.

The best remedy for this evil is that no meetings of friendly societies should ever be allowed to take place at a public house. In default of such a regulation, it should not be rendered *compulsory* on members to spend anything for "the good of the house," but each should pay for what he chooses to order.

The superiority of enrolled over unenrolled societies is likewise a point that scarcely needs enforcing. Not the least advantage that arises from a society thus being recognised by the government is, that fraud by the managers of an enrolled society is punishable by justice. But it unfortunately frequently happens that a society, however well managed in all other respects, is defective in one, and that the fundamental, particular. The rates of contributions are far below the liability incurred. This, in connection with extravagant management, has been productive of much evil. We have collected abundant evidence which shews that these societies often fail just when their aid is most required. We select the following communications out of many others.

An old member of a society in the neighbourhood of Bridgwater writes, "I have been paying in for twenty-seven years, and have never received a penny of sick-relief, and now I am old and sick there is no money to be had."

From a resident near Frome we learn, "Our local clubs have often failed. I have known people pay in for twenty years, and when too old to join another society, and most needing sick-relief, their club has broken up."

At Wellington, Somerset, Mr. Toms states, "there were in fifteen years ten or twelve societies, not one of which is now in existence."

The main cause of such deplorable results will be seen in the following remarks by Mr. Neison:—*

"That a general idea may be formed of the condition of Friendly Societies in respect to the adequacy of their contributions for the benefits held out by them, fifty Societies have been selected at random, and in order to make the illustration more simple, one period of life only, age 35, has been fixed on, and the rates in each of the fifty societies in question examined and graduated to represent an allowance of 1*l.* per week during sickness, up to the age of 70; an annuity of 13*l.* per annum for life after; and a sum of 10*l.* payable at death, whenever that may happen. The corresponding rates having been determined in each Society for the above scale, they were found to average only 1*l.* 11*s.* 5*d.*; but in many of the Societies an entry money is paid, and for the same age it was found to average 1*l.* 1*s.* 9*d.* As the value of the temporary annuity at the same time of life is 17·88172, the above entry-money will be equivalent to an annual contribution of 1*l.* 12*s.* 8*d.* The entire inadequacy of such a contribution to provide for the benefits offered must be apparent; page 121 will show that for the single benefit of 1*l.* weekly during sickness the annual contribution should be 2*l.* 7*s.* 9½*d.*, and on examination of the respective tables it will be seen that the contribution adequate to provide for the three benefits offered is 3*l.* 7*s.* annually, or more than double the actual amount collected. It is a most lamentable condition in which to find Societies aiming at designs so benevolent and praiseworthy. It may seem strange that they should endure for even a year or two; but if the amount of sickness at page 98 be examined, and the young period of life at which members generally enter borne in mind, it will appear that they may survive at least 25 or 30 years before their insecurity may become evident to an ordinary observer. Members are generally satisfied in the first periods of a Society to find that the income has exceeded the expenditure and left a respectable balance; losing sight of the great accumulations which are necessary to meet the future liabilities incidental to their increasing years and infirmities. As a Society advances its income will invariably, in connection with a given number of members entering at a particular age, decrease with the increase of its expenditure. Suppose a Society to commence with a given number of members all 35 years of age; in 25 years afterwards the income from those members, through the deaths that take place in that period, will have decreased to seven-tenths of its original amount; while its expenditure on sickness will have trebled, and the members fast approaching a time of life at which the expenditure will be ten times the original sum. This is a state of things for which the contributions of a Society should make ample provision; but unfortunately few have so considered the subject as to protect themselves against such vicissitudes."

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* 'Vital Statistics,' p. 132.

The chief remedies that we have to suggest for the more efficient working of Friendly Societies are—

1st. That a separate scale of payment should be made for the admission of persons engaged in arduous or unhealthy labour, such as miners, colliers, railway servants, painters, sailors, &c. It is obviously unfair to those occupied in lighter trades, such as gardeners, farm-labourers, &c., that all should be charged at the same rate.

2nd. That a graduated scale of payment be substituted for a fixed sum. Sickness increases at a rapid rate after the age of 60. Societies would adopt a safer course of limiting sick relief to persons under 60 or 65 years old. Members might, with such an arrangement, purchase government annuities which should commence at the age when the relief afforded by friendly societies ceases. A man aged 25 would have to pay 16*s.* 3*d.*

a-year to ensure an annuity of 5*l.* to commence at the age of 60.

3rd. That the costs of management should be restricted within closer limits. A large amount of contributions, which should be put by for sickness or age, is commonly squandered in feastings and processions, so that provident societies are often the means of teaching improvidence.

4th. But the most important remedy of all is the substitution of proper statistics for the present incorrect and imperfect Tables on which friendly societies are for the most part based. The passage which we have already quoted from Mr. Neison's book shews how much an alteration in this respect is wanted. Without perfect data from which to start, all other precautions are useless.

In connexion with friendly societies may be mentioned those numerous clothing, coal, and provident funds, which are supported partly by charity and partly by the contributions of the labourer himself.

These institutions are doubtless productive of good, since they testify to the sympathy of the higher classes with the lower. They should be encouraged also, because they testify that mere alms-giving is no more charity than a part is the whole; and that, while the compassion of the pitiful will not be stinted, yet true benevolence flows in appointed channels, and submits to unwelcome restraints. To the cottage visitor it may seem a hard saying that a knowledge of Blue-books must precede any great and permanent improvement in the condition of those for whom he would almost "dare to die." Yet although he may know as little of statistics as of fluxions, he may rejoice to think that it is by his means that returns and tabulated figures become clothed with life; that it is he who enables the porer over parliamentary reports to become a very "Rembrandt of rhetoricians," the orator of a nation's assembly.

It is certain that the best way to help the labourer is to enable him to help himself. But a complete knowledge of the condition of the poor in our own neighbourhood, on our part, is by no means incompatible with independence on their part. The one will be conducive to the other so long as we remember that the almoner of feudal times is superseded by the statistician of the nineteenth century.

As a favourable instance of the tabular system we append an account of the poor at Staplegrove in the vicinity of Taunton, which has been kindly furnished us by Mr. Gillett, of Fairwater, who is himself the registrar.

near Taunton.

Names.	Adults.	Children.	Employers.	Men's Wages.	Women's Wages.	Rent.	Beds.	Quilts.	Blankets.	Remarks.	To be Provided.							
											Blankets.	Sheets.	Woollen Petticoats.	Cotton Petticoats.	Waistcoats.	Woollen Stockings.	Cotton Stockings.	Shifts.
				s.	*s. d.*	*s. d.*												
Bond, John and Mary	2	5	Monday ..	6	2 6	2 0	3	3	5	Has 5*s.* 3*d.* per week pension, ¼ acre of land, and house dirty.	1	..	..	2	..	..	..	..
Cridland, Rebecca ..	1	..	..	..	..	..	1	1	1	Has 2*s.* 6*d.* per week from parish	1	..	..	..	1	..	..	..
Fudge, David and Mary.	2	..	Tucker ..	7	..	2 0	2	1	3	Woman takes in washing, and appears comfortable.	..	..	..	..	2	..	..	..
Knight, John and Harriett.	2	5	Amery ..	7	1 6	1 6	3	2	4	One bed is a cot	..	..	..	..	..	..	..	..
Langham, Henry and Jane.	2	2	Monday ..	7	2 6	2 0	3	3	3	One blanket, bad; has 2 lodgers, and ½ acre of ground.	1	..	1	..	1	..	..	..
Low, Samuel and Mary.	2	2	Hall	9	2 0	2 0	3	2	7	Two blankets, bad; woman is weakly.	..	..	..	..	..	..	..	..
Pomeroy, Robert and Betty.	2	5	Chappell ..	7	5 6	1 8	3	3	6	Leaves the parish at Christmas: 2 blankets, bad; very dirty.	..	1	2	..	..	..	..	..
Scott, Robert and Betty.	2	..	Amery ..	7	..	2 3	..	..	..	Plenty of bedding; things very clean.	..	..	..	..	1	..	..	..
Seaford, Joseph and Sylvia.	2	5	Ball	6	1 0	..	3	3	5	3 blankets, bad; pays no rent ..	2	..	..	2	1	1	..	1
Spiller, John and Susan.	2	4	Sawyer ..	..	..	4 0	3	3	3	3*s.* per day when employed as sawyer; has 2 acres of land: query if he has not property?	..	..	1	1	..	..	..	..
Strickland, Jos. and Jane.	2	3	Amery ..	7	..	2 0	2	2	2	Bedsteads, bedding, &c., very bad	2	..	1	1	..	..	..	..

WASTE LANDS.

Thus far we have been dealing with those matters which more directly affect the well-being of the labourer, and which are more immediately under the control of landowners and farmers: but we cannot close this paper without referring to other topics of great importance, since they most materially affect the prosperity of the agricultural classes. M. Léonce de Lavergne, in his most able and interesting 'Essay on the Rural Economy of Great Britain and Ireland,' known doubtless to many of our readers, makes the following remarkable observations on the county of Somerset:—

> "It would seem as if great prosperity ought to be enjoyed by a county which possesses so many advantages, which is situated at such a short distance from London, which embraces within its boundaries markets (débouchés) like Bath and Bristol, which has been, moreover, favoured by nature with that fine pasture-land for which so high a rent is obtained; nevertheless the working-classes suffer. The excess of population is the manifest cause of this suffering. It is an excess which, by exciting an undue competition for farms, has, at the same time, raised the rents and produced a too great division of holdings. Since the year 1801 the population of Somerset has increased from 280,000 to 460,000 souls; the wealth of the county has not augmented in the same proportion: hence this disturbance in the equilibrium, *which can be remedied only by an increase of production, or by a reduction of population.*" *

Which alternative is the more practicable will be easily seen from a sentence which precedes the above:—

> "In the county of Somerset, which borders on Devonshire, one of the most deserted and uncultivated districts in England, the granitic † land, known as the Forest of Exmoor, contains about 8000 hectares (20,000 acres), abandoned to a species of half-wild sheep." ‡

That is to say, in the county of Somerset, where the working classes thus suffer, and where the population is so overabundant, there are about 20,000 acres of land left totally uncultivated. These facts are fully confirmed by Mr. Acland, in his Report on the Farming of Somersetshire, who, after noticing the fact that the population of that county is nearly doubly as dense as that of Lincoln, goes on to observe that—

> "There are thousands of acres which require underground draining; that there are large tracts of fen or peat moors on which clay or marl might be spread with advantage; that good stone roads are required throughout the marshes; and that, in order to make such investments of capital profitable to

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* 'Essai sur l'Économie Rurale de l'Angleterre, de l'Écosse, et de l'Irlande.' 2me édit., p. 251. Paris, Guillaumin et Cie., 1855.

† M. de Lavergne is mistaken here. There is no granite in Exmoor. Nor is he aware that Exmoor can show splendid water-meadows and good turnip-fields. —T. D. A.

‡ 'Essai,' &c., p. 250. The first edition of this work has been translated, with notes, by "A Scotch Farmer."

the fullest extent, great improvement in the whole system of sewers and drains is required. . . But the permission to break up inferior grass-lands is, perhaps, one of the simplest modes by which the owner of land in Somersetshire may benefit at once the labourers and tenants."—See *Report*, p. 102.

In Devonshire there are 454,400 acres of waste land, of which Dartmoor alone includes 250,000. Much of this, says Mr. Tanner in his Prize Report, Royal Agricultural Society's Journal, 1848, might be rendered productive, and would afford a large amount of employment to the labourers, many of whom during the winter are supported by the public rates. Since this Report was written an interesting experiment has been made in Dartmoor by Mr. George Fowler, of Prince Hall. He carried out his improvements with much perseverance and determination; and it is stated that on the 12th of May, 1856, fields fetched nearly 60*s*. an acre, which in 1847 had been worth no more than 1*s*. 6*d*. to 2*s*. per acre.

In Dorsetshire, where there is a very large extent of downs, breaking up has proceeded with great vigour. Mr. Ruegg, in the Prize Report, Royal Agricultural Society's Journal, 1855, says that this may be reckoned at thousands of acres. The example was set by Lord Portman, and Lord Rivers has brought a "sheet of downs" into cultivation.

In Cornwall there are about 200,000 acres of waste land, a large proportion lying on the central ridge of the county. These extensive wastes are gradually being reclaimed by the miners and cottagers. The late Earl of Falmouth and Lord Dunstanville gave great impetus towards the reclaiming of this coarse land by granting pieces of from three to five acres on leases of three lives, at a small conventionary rent of from 2*s*. 6*d*. to 5*s*. per acre, on condition of the tenants building cottages thereon. The value of the plots average from 10*s*. to 20*s*. per acre. (See Prize Report of the Farming of Cornwall, by Mr. W. F. Karkeek, Royal Agricultural Society's Journal, 1845.) The advantages of reclaiming waste lands and of draining are, says Mr. Nicholls, that they afford employment to the labourer, and are remunerative to the employer. It is important that the labourers should always be occupied; and it is a question whether it would not "be better that the master should keep his workman at work, even though it might not be altogether remunerative, than be compelled to contribute to his support without receiving any return whatsoever."

The quantity of land in the United Kingdom is estimated at 77,394,433 acres, of which 15,871,463 acres are unprofitable wastes.

The quantity absolutely cultivated is probably under 50,000,000 acres.

But besides these actual wastes Mr. Bravender asserts (see

Prize Essay, Royal Agricultural Society's Journal), that at least one quarter or four millions of acres of present dairy farms might be broken up and the supply of our butter and cheese not be diminished. At present these occupy 43,470 men; if converted into arable they would employ 174,000 men, giving a balance of 130,530. Farther, these 4,000,000 acres would require draining at a cost of about 4*l.* per acre, or 16,000,000*l.*, all of which would pass through the hands of the labourer, and would employ 320,000 men for twelve months. Besides this an additional number would be required by the plan of soiling, which would force its way into use. So that 200,000 labourers would be required permanently, and would provide food for one million families, or five million people, and that without greatly altering the present mode of agriculture. One of the chief difficulties with which the cultivation of such wastes as Dartmoor has to contend is the severity of the climate; this may not be an insuperable obstacle, but is at least one which imposes very stringent conditions on all attempts at improvement.

We ourselves have seen lands reclaimed under more unfavourable circumstances. The forest of the Ardennes, in the Belgian province of Luxembourg, lies from 1000 to 2000 feet above the sea-level. It is the first high ground passing from Russia southwestwards. Against this elevated plateau the cold north-east winds beat with great violence, and the winters are long and severe; so lengthened indeed, that the trees are not in leaf till midsummer, and frosts in July are not uncommon. The geological stratum is the same as that of Dartmoor, viz. granite. The surface is covered with heath and broom, "man's natural enemies," as Humboldt styles them. Yet here, though there are no *débouchés*, though the soil is perfectly destitute of lime, which has to be procured from a place seven leagues off, in this desolate wilderness English energy and English enterprise have already achieved wonders. One gentleman, who has recently bought an estate of about 300 acres, has, during the three years that he has occupied it, wrought a vast improvement. Surely, then, if with all the disadvantages of removal from the markets, of dffiiculty of transport, and of severity of climate, so much has been accomplished in the "Forest of Arden," the agriculturist at home need not be discouraged.

In granting leases, landlords or their legal advisers not unfrequently insert a very stringent clause against the breaking up of any pasture-land: a penalty of 50*l.* per acre is usually threatened for such a proceeding. This provision, though generally needful, does, we think, to some extent act prejudicially to the interests both of the owner and the occupier of the land, since it tends to check the improvement of those poor grass-lands which we have shown might be so advantageously converted into arable. Instead of a penalty a premium has in some cases been offered to the farmer for such an operation. In Mr. Sturt's 'Tenant Security Rules,' we read, "For conversion of all pasture-land into arable, the outgoing tenant to be allowed 15*s.* in the pound for paring and burning before the first corn or pulse crop is taken." (See Mr. Ruegg's Prize Report on the Farming of Dorsetshire, Royal Agricultural Society's Journal, 1855.)

The subject of *draining* has been alluded to in the above remarks, with which it was naturally connected. When we consider that not more than twelve years have elapsed since drainage was first talked of, and since then upwards of two millions and a half of acres have been drained, so that, as M. de Lavergne remarks, England "appears a second time to have risen from the waters," we may well hope that this important improvement will be generally adopted to the great benefit both of farmer and labourer, and we may gather confidence as to the effect on the labourer of future applications of capital to the land.

There is yet one other point which vitally affects the condition of the working classes; we refer to the division of land. The tendency of agriculture is now towards the system of large farms, and each amalgamation of estates diminishes the labourer's chance of raising himself. During the last fifty years the class of small farmers living on their own land, or yeomen, has been fast dying out, and even in Cumberland, where the "statesmen" have lingered in existence beyond their less fortunate southern brethren, unmistakeable signs warn us that the time is not far distant when the good yeoman, the "gentleman in ore," as Fuller calls him, shall have utterly passed away.

The rapid extension of the "grande culture" cannot but cause deep anxiety to the political economist; more especially when he remembers that in those countries where the agricultural and, indeed, the whole population is most prosperous, such as in Flanders, Switzerland, and the Channel Islands, there the land is divided amongst an infinite number of proprietors. England is each day becoming more the country of great extremes. Here lordly wealth and abject want live almost side by side. The friend of the agricultural labourer cannot but view with alarm a system which still further separates these extremes, which has "knocked away several rounds from the social ladder," and rendered it well nigh impossible for the servant ever to rise into the dignity of an employer.*

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* Mr. Gabriel Poole, of Bridgwater, whom we gladly take this opportunity of thanking for the very valuable information with which he has furnished us, states, however, that in his own neighbourhood the alluvial district lying east of the town is "infinitely subdivided. Many of the landowners are resident farmers; many

THE LAW OF SETTLEMENT.

The surest index of the condition of a people is its poor-law. The poor-law of Henry VIII. was very simple. A "valiant beggar," or, in modern language, an able-bodied vagrant, was ordered "to be tied to the end of a cart, naked, and be beaten with whips throughout the same town, till his body be bloody by reason of such whipping; and after such punishment of whipping had, the person so punished shall be enjoined upon his oath to *return forthwith without delay to the place where he was born . . . and then put himself to labour like a true man ought to do.*"[*]

Here then we have the principle clearly established that the pauper ought to be returned to the parish which gave him birth, and so far the "law of settlement" of the sixteenth agrees with that of the nineteenth century. But then follows an all important difference. The pauper in Tudor times could ask for work as his *right.* Now he can demand only that he shall not *starve.* Three hundred years ago no able-bodied man in the kingdom need be idle; idleness was a crime. Now we make men idle against their wills.

The benevolent provision of our poor-law that "the ratepayers may direct that a sum, not exceeding half the average yearly rate for the three preceding years, be raised or borrowed as a fund for defraying the emigration of poor persons having a settlement in the parish," is completely nullified by the cumbrous machinery

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of them have their estates in mortgage; yet in this district it will be found that the population is greater, and the rate of wages higher, than they are west of Bridgwater; *while it is impossible to say where the gentry end and the yeomen begin, or where the yeomen end and the labourers begin.* Numbers of the tenantry began life as labourers; then took some potato or teasle ground, at a high rent; then rented some cows, until they had saved enough to buy for themselves; then they took a field here, and another there, till they had saved enough to stock a farm; and then they rent one. I believe that the yeomanry of this district are much more wealthy as a class than in the districts where land is not subdivided. I have thought right," adds Mr. Poole, "to call attention to this district, since the examples of France and Ireland, which are usually quoted, appear to me to stand on a different ground; the subdivision of land in those two countries having taken place, not in obedience to the law of supply and demand, but from compulsion in France by law, and in Ireland by the general abstraction of all surplus capital, which ought naturally to be employed in works promoting demand for labour."

We cannot do better than advise those of our readers who are interested in this matter to refer to Mr. Kay's work on the 'Social Condition and Education of the People;' to Laing's 'Notes of a Traveller;' to Thornton's 'Plea for Peasant Proprietors;' and Stuart Mill's 'Principles of Political Economy.' Alluding to these two latter works, M. de Lavergne remarks, "Je suis heureux de voir ces idées [*i. e.* the "petite culture" system] se répandre dans la patrie d'Arthur Young. Pourvu que cette réaction n'aille pas trop loin, et on peut se fier aux Anglais sous ce rapport, elle ne peut porter que de bons fruits."—p. 382. We take this occasion of thanking Mr. Barbit for a very interesting 'Account of the Agriculture of the Channel Islands, with special reference to the Division of the Land.'

[*] Froude, 'History of England,' vol. i., p. 61.

which is required to carry it out. And although the expense to a parish of defraying the passage of a family to Canada was even a quarter of a century ago estimated at a much lower sum than that of maintaining it at home for one twelvemonth, and though this disproportion is now very much greater, we rarely allow the pauper to choose between civil death in the workhouse and life in the colonies, but insist that, come what may, he shall settle in the parish which had the misfortune to give him birth.

It requires no special gift of foreknowledge to warn us of the effects of such a system. Experience will supply our lack of prophetic power. The roofless cottage and the crowded attic "point the moral" of the "law of settlement." Thus we are told that in the neighbourhood of Norwich the extent to which the destruction of cottage property is carried on is "fearful and disgraceful." It is impossible to obtain a piece of ground for building purposes in any of the villages within eight or ten miles of Norwich. There are not less than 500 agricultural labourers who are thus compelled to reside in the city of Norwich, and to walk to their work distances of from three to seven miles. In five villages of Buckinghamshire, the number of families having increased by 129 in a certain number of years, the dwellings were diminished by 41. In seven villages of Suffolk the increase of families was 248, the decrease of residences 124. While in five villages of Sussex the increase was 62, the decrease 59! Nor is this evil confined to the east of England.* We ourselves could point to instances in the neighbourhood of our large towns where those who from their wealth and position ought to have set a far other example, have pulled down the cottages on their estates, and compelled their labourers to walk some six or eight miles every day by way of fitting them for their work.

The man who spares his pocket is always deemed shrewd. He who makes another pay for him is thought wiser than the serpent. Amongst *honest* men there is but one name for such a deed as this, and that name Robbery. We believe, moreover, that this cunning has overreached itself. It cannot be expected that the man who has to spend a considerable portion of his strength in travelling to and from his employment will be able to work with the energy and the vigour of one whose occupation lies close to his own door. Poor-rates are paid by the *whole* parish. The farmer *exclusively* reaps the benefit of improved labour ; he will do well to ponder these things.

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* Messrs. Spender and Isaac have to some extent misapprehended the object and the effect of the law of settlement. After the breaking up of the feudal system in the reign of Henry VII., feudal retainers were no longer necessary to the nobles. A system of clearing away houses and villages for the purpose of adopting an extended system of sheep-farming was introduced, and large tracts were depopulated in all parts of England. Acts of Parliament were passed during several succeeding reigns forbidding the pulling down of dwellings, and even limiting the number of sheep that might be kept by one individual. All was, however, in vain, until the Settlement Act of Charles II. was passed, which put an effectual stop to the abuse.

The effect of the laws of settlement in producing what are called clearances, in particular cases, including one of those referred to in the text, has been much exaggerated. In those parts of the United Kingdom, Scotland and Ireland, in which our settlement laws have not been introduced, clearances of the most sweeping nature have been perpetrated within the last half-century.—R. SMITH.

EMIGRATION.

We have already stated that many of the evils which at present affect the labourer arise from the overcrowding of the labour-market. It is clear, therefore, that any means which will relieve this pressure, or even counterbalance by removal the present increase of population, must improve the condition of the labourer. The present increase in the number of inhabitants is at the rate of 240,000 yearly; therefore unless emigration, or increased means of labour, are introduced, the comforts of the people must continue to decrease. In Ireland, before "the Exodus," 300 persons existed to the square mile, and a fearful state of destitution prevailed. The failure of the potato crop, however, in inducing the superabundant population to seek other homes, has proved the regeneration of that country. In England at the present time there are about 260 persons to the square mile. Emigration still goes on, and in 1852 had arisen to the enormous number of 368,700 emigrants. This, be it remembered, is the growth of the last 30 years, for in 1815 only 2081 persons left our shores.

Australia at the present time offers the most advantageous field for labour. It may not be generally known that distant 1*l.* in point of expense, and 63 days in point of time, lies for the agricultural labourer a land of plenty, and a market where his labour will fetch its full value. So strongly do the governments of our Australian States feel it to be their interest to increase the supply of labour that they devote half of the proceeds of the land sales to provide free passages to mechanics and labourers to their "land of promise." From 1847 to 1854 inclusive 2,625,000*l.* were sent by the Australian colonies to defray the expenses of emigrants.

Government has established agents in different parts of the country to decide on the eligibility of applicants for free passages. The following are the different classes to whom such passages are granted, with the payments required from each in consideration of such boon. New South Wales, it should be remarked, is the only district to which free passages are now (1858) granted.

		£.	*s.*	*d.*
Class 1.	Married agricultural labourers, shepherds, and herdsmen, under 45 years of age	1	0	0
„ 2.	Ditto 45 and under 50 years of age	5	0	0
„ 3.	Ditto 50 and under 60 years of age	11	0	0
„ 4.	Single men of any of the above classes not exceeding 40 years of age	1	0	0
„ 5.	Single female domestic servants not exceeding 35 years of age	0	10	0
„ 6.	Married country mechanics (when they can be taken), such as masons, bricklayers, blacksmiths and farriers, wheelwrights, sawyers, and carpenters; also gardeners, if under 45 years of age	5	0	0
„ 7.	Ditto 45 and under 50	8	0	0
„ 8.	Ditto 50 and above	15	0	0
„ 9.	Single men of Class 6th under 40 years of age	5	0	0

The effect of emigration has to be considered in two aspects—the benefit to those who go from, and the benefit to those who remain in this country. As regards the latter, it is clear, if they are relieved from the excessive competition due to the denseness of population, their condition must be improved. In respect to the former, the letters of the emigrants themselves give most conclusive evidence. Mr. Charles Moore, of Bath, who has given considerable attention to this subject, and who has been the means of sending within the last 10 years upwards of 3000 labourers as emigrants from the West of England, says—"I have heard most encouraging accounts from many of those who have gone, and not a single complaint from any."

From a large number of communications most obligingly placed at our disposal by the abovenamed gentlemen, we select the following as fair samples of the rest:—One man who left Cirencester February 15, 1856, and landed at Melbourne in June, and who previously was starving and without a bed to lie on, states, "That after staying a month at the depôt (a home provided by Government to the emigrant free of expense till he is hired) he was hired at a dairy-farm at 65*l.* a year and all his provisions, a house to live in, and wood and water were given in addition." He says—"I wish I had met with such a friend about 10 years ago, I should have been a gentleman; for this is the country to get money. Farm-labourers earn 3*l.* to 3*l.* 10*s.* a week. Quarrymen 3*l.* 10*s.* to 5*l.* a week. My sincere thanks to those who sent me out, for if I had stayed in England I should have been famished to death." Further instances are given by the rector of a parish near Chippenham of the improvement that the labourer effects in his condition by emigration. "One of our parishioners who was in receipt of parish relief has now 120 acres of land, 50 head of cattle, 7 horses, and sends home 5*l.* to an aged parent. Another who went out under similar circumstances realized in a very short time 400*l.*" Examples of the same kind might be multiplied. All show that to the agricultural labourer the colonies present a golden field for industry. We have spoken only of the Australian colonies, as free passages are granted to them alone, and it is obviously impossible for the labourer to save his own passage money to others.

"I have little doubt," says the gentleman to whom we are indebted for the above information, "that the condition of the labouring population in the West of England is improved as compared with former years. Not so much, perhaps, from an increase in the value of their money-wages, as compared with the price of food; but rather from their having more constant and steady employment."

We have now arrived at the conclusion of our task. We have considered in detail the labourer's work and his pay, his education and recreation, his dwelling and garden, and various other points affecting his peculiar comforts and prosperity. We have attempted to show—

1st. That the labourer's work should always, when practicable, be done by the piece, instead of by the day.

2nd. That the labourer's pay should *always be* in money. We have dwelt at considerable length on the practice prevalent in the West of England, where the labourer is paid a large proportion of his wages in cider; and have endeavoured to show that it is prejudicial to the farmer and labourer, and that it might be abolished.

3rd. That education is the labourer's right, and the master's profit. That anything which calls into exercise the mental powers raises the condition of the workman and thereby renders him more efficient.

4th. That the labourer's recreation should be of a higher class than that now afforded to him.

5th. That the labourer's dwelling is too commonly badly built and badly ventilated. We have offered some practical suggestions for the management of cottage property.

6th. That the allotment system is of great benefit to the labourer; but should be carried out with great caution, and be viewed merely as a temporary measure.

7th. We have briefly adverted to friendly societies, showing how it is that they often fail to secure the professed advantages, and how they may be rendered more efficacious.

Lastly. We have considered those other matters which affect the condition of the agricultural labourer, referring to the enclosure of wastes, the breaking up of poor lands, the division of land, the law of settlement, and to emigration.

What then is the future of the agricultural labourer? Can we look forward with any degree of hope to the time when he shall be properly educated both intellectually and morally; when he shall not be deprived of health-giving recreation; when his house and garden shall be so real a home to him that the beer-shop shall offer no temptation? May we ever hope to see the day when, with work always to be had, and wages sufficient to keep himself and his family in comfort, he shall no longer feel that he is one of a separate nation, the nation of the poor; always, though secretly, hostile to that other nation—the nation of the rich; but rather belongs to that one body of which when any member suffers all the members suffer with it; and which prospers only when all are in prosperity? We *may* look for this golden-age if only we take right means to bring it about. One thing is very certain—that the labourer will each year become less of a mere tool and more of a responsible agent. The master will find that machinery will accomplish mechanical work far more cheaply than it can be effected by human labour; and from this it will follow that the living workman will be called upon to undertake higher tasks; tasks which will require judgment, forethought, and a scientific education. Then, the poet tells us—

"Wealth no more shall rest in mounded heaps,
But smit with freer light shall slowly melt
In many streams to *fatten lower lands*,
And light shall spread, and man be liker man
Thro' all the season of the golden year."

Soon may that good time come! But before it can come there must be greater sympathy between the wealthy and the working classes, a sympathy founded on a more complete acquaintance the one with the other.

"Those who seldom or never see each other," said the Bishop of London on a recent occasion, "can scarcely be expected to feel much for each other. It is of the greatest importance that those to whom Providence has given the advantages of wealth and its attendant blessings, should distinctly consider it a part of their duty to mix with the poor, to see more of their dwellings, to learn to love the poor, and to look upon them as one with themselves."

Greater knowledge will induce more perfect charity. The weak we shall aid, the fallen we shall restore, remembering that,

"Ce mortel qui s'égare
Est un homme, et ton frère."

Then there shall be no longer that antagonism of classes, that incompatibility of interests; the rich shall no longer be covetous to add house to house, and field to field; but will leave to his poorer brother, the labourer, some chance of rising to the dignity of the employer. Then, to quote our laureate once more,—

"Shall all men's good
Be each man's rule, and universal Peace
Lie like a shaft of light across the land,
And like a lane of beams across the sea,
Through all the circle of the golden year."

APPENDIX.

TABULATED RETURNS RELATIVE TO THE CIDER QUESTION.

1st. CORNWALL.

Name of Gentleman who has furnished Return.	ANSWERS TO ENQUIRIES.				
	Rate of Wages actually paid in Cash.	How much Cider or other liquor in addition, and Price of the same?	Has the plan been tried of giving Money instead of Cider, and with what result?	Would the Labourer prefer his Wages paid in Money or in Cider?	Do you think it would be generally advantageous to pay Wages in Money instead of Cider?
1. BADCOCK, Henry, Launceston.	8*s.* 6*d.* to 12*s.* per week.	No liquor generally supplied.	Mowing and reaping occasionally let without cider.	In districts where liquor has been discontinued they would prefer cash in full.	Except when the work is heavy in summer, the general payment of wages in cider is a great loss to the labourer's family, without any corresponding benefit to himself.
2. BATES, Hender, Blisland.	12*s.*	Liquors do not constitute part of the wages of the labourer.	.. ..	I think it would be better to dispense with the practice of paying wages in any kind of liquor. In taking the office of Surveyor of Highways in this parish, I found it had been the practice on many occasions to give the labourer liquor in part of wages. I have adopted the practice of paying their full wages in money; this proves best, as they can now lay out their money to better advantage.	
3. BROWN, J. C., Barton Landrake.	10*s.* to 11*s.*	The general allowance is a quart per day; in the harvest an additional quantity.	Yes.	In the majority of cases the labourer would prefer money to cider.	I think it would be generally advantageous to dispense with the cider or other liquor, inasmuch as the labourer's family would be benefited thereby.

4. **Corfield**, Thomas, Penryn.	10*s*. to 11*s*. per week.	No cider is given.	Wages are generally paid in cash.	Unless the wages were paid in cash the labourer would be dissatisfied.	If cider or ale were given, I should by all means say it would be best to discontinue it and give the value in cash.
5. **Goldsworth**, John, Hayle.	12*s*. per week.	Liquor is only given in harvest-time.	The practice of giving liquor is only in the harvest-time, when the men seem to require extra stimulant.	The men would not prefer cash to cider in harvest-time. No cider is given at other times.	
6. **Hambly**, Peter, Liskeard.	12*s*. per week.	A pint a day is sometimes given during harvest or extra work.	The change from a large to the present small quantity has been gradual, chiefly in consequence of less being made. As it was never taken as wages, no increase of wages has taken place as compensation.		
7. **Julian**, Thomas, Lanivet.	12*s*. per week.	It never has been the custom to give cider or other liquors.	The wages are entirely paid in money.	.. ..	It has been proved beyond contradiction, that cider or other liquors are not beneficial in assisting to sustain labour. Farmers renting from 300*l*. to 400*l*. a year never give any cider or other liquors in harvest, and the men do their labour better without it.
8. **Lobley**, John, Liskeard.	12*s*. per week.	The usual practice is a money-payment without liquor.	The labourer generally prefers the money-payment when the choice is offered him.	.. ..	The labourer's family derive no advantage from the wages paid in liquor, and discord frequently arises between master and men as to the quality of the article supplied.

TABULATED RETURNS RELATIVE TO THE CIDER QUESTION—CORNWALL (*continued*).

Name of Gentleman who has furnished Return.	ANSWERS TO ENQUIRIES.				
	Rate of Wages actually paid in Cash.	How much Cider or other liquor in addition, and Price of the same?	Has the plan been tried of giving Money instead of Cider, and with what result?	Would the Labourer prefer his Wages paid in Money or in Cider?	Do you think it would be generally advantageous to pay Wages in Money instead of Cider?
9. MICHELL, John, Truro.	12*s.* per week.	No cider or liquor is given except in harvest.	.. ..	The labourers prefer cash to liquor.	The practice of paying part of the wages in cider induces the habit of drinking and the evils that follow.
10. NATTLE, T. W., Liskeard.	12*s.* per week.	No cider given except in harvest.	I have given 6*d.* per day instead of cider, greatly to the advantage of self and labourer; but last year I gave tea, cocoa, and ginger beer, only at about the same cost, and the labourers expressed themselves well satisfied.	Labourers are generally greedy after beer and cider; but I am confident, if they were liberally supplied with other wholesome drinks, the benefit would be mutual.	It would be for the advantage of the labourer to dispense with liquor entirely.
11. OLIVER, Thomas, Trescow, St. Mabyn.	Average 9*s.* to 10*s.*; 12*s.* occasionally.	No liquor is given as part of wages.	.. ..	They would prefer money to liquor.	It would be advantageous to pay all wages in cash. Farm work is not generally so laborious as to require liquor.
12. ROGERS, John, Saltash.	11*s.*	6 quarts a week, at 9*d.* per gall.	Some give 1*s.* a week instead of cider.	Partly in money, partly in liquor.	No; because there is a great deal of cider made in our neighbourhood.
13. PARKYN, Frank, Lerrin, St. Veep.	12*s.* per week.	No liquor is given as part of wages.	.. ..	.. ..	The practice of liquor payments is unquestionably a bad one. The labourer's earnings should certainly be taken to his family for general distribution of common

14. ROSKRUGE, Charles, St. Anthony.	9*s*. constant work; 12*s*. occasionally.	No payment in liquor, as part of wages, exists in this part of the country.	.. ..	.. ..	The payment of wages in cider would injure the labourer, deprive his family of the means of procuring *many* necessaries which *they really need.*
15. STOCKER, Francis, Tregovey.	12*s*. per week.	No cider given except in harvest.	Yes.	.. ..	There can be no doubt it is much to the advantage of the labourer's family that he should be paid in cash. My opinion is, the more any persons addict themselves to drinking habits the more they want, and that it leads to *idleness, drunkenness, wretchedness, poverty, and crime.*
16. TREGASK, Thomas.	12*s*. per week.	No liquor of any kind given except in harvest.	.. ..	.. ..	My men are all teetotallers; they are 6 in number, and I wish all were the same.
17. TILLY, Harry, Falmouth.	12*s*.	No liquor given as part of wages.	.. ..	.. ..	I think it would be advantageous to pay wages in cash instead of cider.
18. TRESAWNA, Grampound.	10*s*. to 12*s*.	Liquors do not constitute part of the wages of the labourer.	.. ..	.. ..	I think it would be very advantageous to substitute cash for liquor, as the latter forms no portion of food or raiment.
19. WHITLEY, Nicholas, Truro.	10*s*. to 12*s*.	Do.	.. ..	.. ..	I prefer cash-payments to those in liquor.

N.B.—The practice of allowing the labourer to purchase corn at a reduced rate generally prevails in Cornwall.

Tabulated Returns relative to the Cider Question.

2nd. DEVON.

Name of Gentleman who has furnished Return.	ANSWERS TO ENQUIRIES.				
	Rate of Wages actually paid in Cash.	How much Cider or other liquor in addition, and Price of the same?	Has the plan been tried of giving Money instead of Cider, and with what result?	Would the Labourer prefer his Wages paid in Money or in Cider?	Do you think it would be generally advantageous to pay Wages in Money instead of Cider?
20. Belfield, John, Paington.	10*s.*	3 pints per day, at 8*d.*	Yes; with perfect success.	Entirely in money; except from force of habit, which induces them *at first* to prefer cider in part.	Certainly; as the labourer's family are losers to the extent that cider is given in lieu of wages, and *he contracts a habit* of drinking, which often leads him astray.
21. Bowring, John, Exeter.	6*s.* 6*d.* to 9*s.*	2 quarts per day, value 2*d.* per quart.	In a few cases.	My experience suggests, that the older labourer, from habit, prefers his cider, but that a young labourer, just married, prefers taking the additional money to his wife.	There could be no question that it would be advantageous; 20 per cent. of the wages are now paid in cider, which injures the labourer's health and morals, and deprives his family of proper support.
22. Beadon, William, Honiton.	9*s.* to 12*s.* The head carter has 11*s.*, and the shepherd 12*s.*	2 pints per day, with unlimited supply in harvest; worth 1*s.* per per gall.	Yes; but unsuccessfully. The case resulted in a compromise, more of the wages being paid in cash and less in cider.	The labourers prefer part of their wages in cider. In moderation it gives relish to their humble meals.	The result of a long experience and observation convinces me it is best to pay part of the wages in cider. More work is done, and more cheerfully.

					cider would procure more nutritious food.
24. **Cook**, Robert, Tiverton.	7*s.* to 8*s.*	2½ gallons per week, at 9*d.*	Yes; but the labourers were dissatisfied and left.	The labourer would prefer liquor to money.	I do not think it would be any advantage to the labourer's family to pay cash instead of cider.
25. **Edwards**, John, Bampton.	7*s.* with liquor; 9*s.* without.	3 pints per day, at 9*d.* per gall.	For 5 years I have paid all my labourers in money, giving liquor only in harvest-time, and they were perfectly satisfied.	I think the labourers generally prefer part liquor, part money.	I do, for this reason; if the man is industrious and has a careful wife, she will be able to prepare such things as they require cheaper by paying ready money.
26. **Fry**, Robert, Culmstock.	8*s.*	4 pints per day, at 6*d.* per gall.	Not to any extent.	From long habit the labourer would prefer having his customary allowance of cider.	Yes; if the men would abstain from buying liquor elsewhere.
27. **Kemp**, John W., Bampton.	8*s.* to 9*s.*	3 pints a day, at 8*d.* a gall.	Yes; but the labourers were not so well satisfied.	The labourer generally prefers liquor.	No; because I think the labourer must have liquor, and if he does not get it in his work he will get it in the beer-shop.
28. **Mudge**, Henry, Paignton.	10*s.*	3 pints a day, at 9*d.* a gall.	Not that I am aware of.	Partly in money, partly in liquor.	I think it would be advantageous to pay their wages entirely in money, inasmuch as their families would then derive benefit.
29. **Northcote**, Sir S. Pynes, Exeter.	8*s.* with cider; 10*s.* without.	3 pts. to 2 quarts, value 2½*d.* a quart.	Only when cider cannot easily be got.	The labourers generally prefer having the cider.	I think men should have the option of receiving the full wages in money if they desire it, but most of them prefer the cider.

TABULATED RETURNS RELATIVE TO THE CIDER QUESTION—DEVON (*continued*).

Name of Gentleman who has furnished Return.	ANSWERS TO ENQUIRIES.				
	Rate of Wages actually paid in Cash.	How much Cider or other liquor in addition, and Price of same?	Has the plan been tried of giving Money instead of Cider, and with what result?	Would the Labourer prefer his Wages paid in Money or in Cider?	Do you think it would be generally advantageous to pay Wages in Money instead of Cider?
30. SILLIFANT, John, Copplestone.	7*s.*	3 pints, at 10*d.* a gall.	Yes, in some instances; but where the cider is commuted for 1*s.* 6*d.* weekly the labourer prefers cider.	I am told the labourers generally prefer being paid entirely in money, if the value of the cider were fairly commuted with a money-payment.	I think it would be desirable to do so; if, as I before said, there was an adequate money-payment. The labourer's family would participate in the benefit, and he would be able to lay out his money to the best advantage, whether in liquor, corn, or any other commodity.
31. VENN, Clement, Uffculm.	8*s.*	½ gall. of beer or cider a day, at 10*d.* a gall.	Yes; but most men prefer liquor.	Partly in liquor in the summer; entirely in money in the winter.	No; as the liquor strengthens the labourer, who works with greater vigour.
32. WATSON, R. H., Totness.	10*s.*	3 pints, at 1*d.* per pint.	I have tried it repeatedly, but found that the labourers bought cider at the cider shops and brought with them.	They are never contented without the cider.	I should much prefer to pay money only and no cider, and believe it would prove of more benefit to the labourer's family.
33. WROTH, Henry, Modbury.	9*s.*	3 pints of cider, at 2*d.* per qrt.	No.	The labourer prefers cider.	I think the labourer would be driven to the public-house if paid in cash instead of cider, which, I think, would not be desirable.

N.B.—A larger quantity of cider is given in harvest; the quantity stated in these returns is the usual average. The same remark applies to Somerset.

34. **Portman**, Rt. Hon. Lord, Bryanstone, Blandford.	Variable.	Variable.	Yes; but it has failed with us, in spite of every effort to make it succeed.	Part money, part liquor.	I think no general absolute rule is advantageous; it should be a matter of bargain.
35. **Harvey**, Mr., Sturminster Newton.	8*s*. to 10*s*.	Occasionally ale and cider during the winter and spring.	No.	No.	In the winter and spring it would be advisable to dispense with liquor.

4th. SOMERSET.

36. **Britton**, Mr., Bath	10*s*. to 12*s*.	1 to 3 quarts.	It has been tried, but with indifferent success.	The labourers prefer liquor to cash.	I do not, as the labourers would then go to an inn or beer-shop, where they would spend both their money and time.
37. **Babb**, William, Wellington.	8*s*.	3 pints a-day, value 8*d*. a gall.	It has been tried in some instances, and, I believe, with good success.	I have several times offered my labourers money instead of cider, and they have invariably refused it.	I am an advocate for supplying cider when they prefer it, as it stimulates them in their work, and prevents their frequenting the beer-shop, the bane of this country.
38. **Beadon**, Rev. Geo. G., Rector of Axbridge.	8*s*. to 10*s*.	2 to 4 pints, at 1*s*. a gall.	Very rarely.	The liquor seems to be preferred.	I think it would; a sufficient reason is found in the fact that giving liquor daily tends to form or strengthen the drinking habit.
39. **Bond**, Thos. James, Wellington.	8*s*. to 9*s*.	3 pints, at 1*s*. 2*d*.	I believe in most cases where money has been given instead of cider, it has been where the farmer has only a small orchard or a bad crop.	In 19 out of 20 cases the labourers prefer part cash, part liquor.	If labourers could get the present value of 3 gallons of cider per week instead of the liquor, it would be better for their families; but the almost invariable addition to wages in case of no liquor is 1*s*. per week.

TABULATED RETURNS RELATIVE TO THE CIDER QUESTION—SOMERSET (*continued*).

Name of Gentleman who has furnished Return.	ANSWERS TO ENQUIRIES.				
	Rate of Wages actually paid in Cash.	How much Cider or other liquor in addition, and Price of same?	Has the plan been tried of giving Money instead of Cider, and with what result?	Would the Labourer prefer his Wages paid in Money or in Cider?	Do you think it would be generally advantageous to pay Wages in Money instead of Cider?
40. CLARK, Joseph, Street, Glastonbury.	8*s*., 9*s*., 10*s*.	3 pints, at 9*d*.	We have tried it here, and find it answer well both for men and masters to give money instead of cider.	The labourer at first prefers part cider.	Where it is fairly tried, the work is done better and the health of the men improved.
41. CLARK, James, Street, Glastonbury.	9*s*.	3 pints a-day, at 7*d*. a gall.	Where it has been fairly tried, it has been to the entire satisfaction of employer and employed.	Nine out of ten of the labourers prefer cash to liquor.	Yes; as it tends to create a habit of drinking, and fosters faction and discontent between masters and men, from disputes about the measure and quality of the cider allowed.
42. ELTON, Sir Arthur, Clevedon Court.	9*s*. to 10*s*.	2 pints, at 6*d*. a gall.	.. ..	The labourer generally prefers his drink of cider to a few pence added to his wages.	If the labourer could obtain a more nutritious diet, cider should certainly be discontinued, and money given instead; but seeing that his dinner is commonly bread and cheese, the latter of very poor quality, it is questionable whether the addition of a little cider is not beneficial both for master and man.
43. GREENSLADE, Rev. Wm., Rector of Stoke-sub-Hamden, Yeovil.	8*s*. to 10*s*.	3 pints a-day, at 8*d*.	It has, but without success.	The labourer prefers to be paid partly in cider.	Most decidedly I do, and that because I believe more of the wages would be applied to the general benefit of the family.

44. GREGORY, A. B., Street, Glastonbury.	8*s*. to 9*s*.	3 to 4 pints of cider a-day, value 10*d*. a gall.	The plan has been adopted for years by some farmers, and they experience much less trouble and difficulty with their men, especially in summer, than their neighbours who allow cider.	Many labourers prefer money only; but the large proportion would, from fear of offending others, prefer liquor.	I decidedly object to the payment of wages in cider; it injures the family, by depriving them of the earnings of the labourer. It seems to me a just and safe principle to requite the labourer in lawful money, and leave him to lay it out as he considers most to the advantage of himself and family.
45. GREGORY, Arthur, Montacute.	8*s*. to 9*s*.	3 pints, at 10*d*.	In one or two cases, with satisfaction to the employed and employers.	From habit, cider is preferred to cash.	Decidedly advantageous both to employers and employed.
46. JONES, Captain, Blagdon, Taunton.	8*s*. to 9*s*.	½ gall. per diem, at 8*d*. per gall.	It has in one or two cases, and the plan is still on trial.	In winter the labourer willingly takes money, but in summer he prefers part liquor.	After many years of close attention, and, I hope, impartial inquiry, I am convinced that the withholding of cider is attended, in the majority of cases, with the very worst results. The labourer requires stimulants in his work, and none is so good as cider; and if the labourer does not have his supply at the farm, he will go to the beer-house.
47. JARVIS, George, Kilmington, Frome.	10*s*. to 12*s*.	3 pints daily, at 6*d*. to 7*d*. a gall.	Yes; quite satisfactory.	If left to their own choice, the majority would prefer liquor in part payment; but where farmers have determined to pay in money only, very little objection is made, and generally ends satisfactorily.	I do, because it would tend to considerably decrease the consumption of liquor amongst the peasantry, and provide them with means of improving the condition of their families.

TABULATED RETURNS RELATIVE TO THE CIDER QUESTION—SOMERSET (*continued*).

Name of Gentleman who has furnished Return.	ANSWERS TO ENQUIRIES.				
	Rate of Wages actually paid in Cash.	How much Cider or other liquor in addition, and Price of same?	Has the plan been tried of giving Money instead of Cider, and with what result?	Would the Labourer prefer his Wages paid in Money or in Cider?	Do you think it would be generally advantageous to pay Wages in Money instead of Cider?
48. KING, J. W., Chilton Polden, Bridgwater.	9*s.* to 9*s.* 6*d.*	3 pints daily, at 9*d.* per gall.	I have been giving money instead of cider, but with the warm weather they have requested to have cider.	The labourer generally prefers liquor to money.	I should prefer the money payment, as the amount of liquor given is seldom properly valued in wages by the workman as in the market.
49. PITMAN, Samuel, Taunton.	9*s.* to 10*s.*	3 pints a-day, at 9*d.* per gall.	The effect of bad habit induces many to give up their employment where cider is withheld.	The labourer generally prefers the cider to money.	If the abolition were generally adopted, I conceive the very greatest benefit must arise both to the employer and employed. Men who at other times are good and steady, become often useless at the very busiest period of the year.
50. PALMER, Joseph, Yatton.	10*s.*	½ gall. a day, 8*d.* to 9*d.*	I am not aware that it has been tried.	Habit would induce the labourer to prefer the present plan.	I am decidedly of opinion that it would be advantageous both to the farmer and labourer if money were the only payment. The family, as well as the labourer himself, would be better fed if the present practices were altered.
51. PALMER, Robert, Long Sutton.	10*s.*	3 pints a day, at 8*d.* a gall.	Money has been offered, but the labourer prefers liquor.	.. ..	As they regularly use cider, I think it costs them less to receive it regularly from their employers than when they buy it, and are thereby

			paid any wages in cider.	Danger, of Huntstile, who gives his men the option of receiving money in lieu of drink, of which they avail themselves largely, and in an increasing ratio, every year.	less loss to the farmer from accidents in harvest-time through drunkenness. The boys, too, will grow up more intelligent and less brutalised, and will not acquire the habit of drinking, which destroys all right feeling in the men.
53. PRIDHAM, William, Montacute, Yeovil.	8*s*. to 9*s*.	3 pints, at 10*d*.	In one or two cases, with satisfaction to the employed and employers.	From habit, cider is preferred to cash.	Decidedly advantageous, both to employers and employed.
54. SOMERS, James, Othery, Bridgwater.	8*s*.	3 pints, at 7*d*.	In a few instances; but has so far failed, the prejudice being very strong in favour of cider.	The labourer prefers cider to money.	Where there is a prejudice in favour of cider, no advantage would be derived; the labourer would be driven to the beer-house.
55. WALTERS, Richard, Perkcombe Well, Martock.	9*s*.	3 to 5 pints, at 6*d*. a gall.	In various instances, and in a few with complete success.	From habit, the labourer prefers cider to money.	It would be desirable to pay wages entirely in money instead of part cider.

X.—*The Cattle of the West of England.* By HENRY TANNER, Land Agent, Senior Member of the Royal Agricultural College, Cirencester.

PRIZE ESSAY.

MUCH doubt attaches to the information which has descended to us respecting the character of the cattle which were found originally in Britain. Although wild cattle are preserved in Chillingham Park in Northumberland, and Chatelherault Park in Lanarkshire, we cannot look upon them with any certainty as specimens of the breed generally existing through England. Still much may be gathered from their habits and disposition to guide us in forming an opinion respecting their ancestry.

It is probable that, as Britain was invaded and the conquered inhabitants retreated into Devon, Cornwall, Wales, and Scotland, they drove with them large numbers of their cattle. With their mode of life nothing was done for improving or modifying the character of the stock; and hence nature, and not man, may be considered to have controlled the produce. Along the western side of England these cattle preserved their original character for many centuries, and great similarity appears to characterise them all. There are grounds for believing that the original colour was *red*. This is a colour indicating hardihood, whilst departure from it indicates a more tender nature, and *white* * is generally received as a token of degeneracy in strength.†

It is somewhat curious to observe that our earliest ‡ authentic records of the cattle of Devon, Cornwall, and Wales, show that the red colour was almost universal. As we proceed northwards cattle become more varied in colour, and hence it is doubtful whether the peculiarities of the climate of the north of England, or, as is most probable, the ingenious character of the invaders of Britain, have been instrumental in perpetuating peculiarities which originally were only accidental. I may illustrate and add confirmation to this view of the matter by a reference to the Herefordshire cattle, because it shows how the accidental peculiarities of *an individual* may become so general as to give a new character to the produce of entire districts. This breed of cattle are now seen almost invariably with deep red coats and white faces. It is within a century that these white faces were introduced, and we have proof* that they originated at Holmer in the following manner:—

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* The specimens of wild cattle above referred to are of a *white* colour, and hence I doubt their being true and *perfect* representatives of the original wild breed of this island.

† And yet among the short-horned cattle we have had more white prize-animals than of any other colour.—R. S.

‡ The early history of cattle within the time of which we have any authentic records points to three kinds—the Long-horn, the Middle-horn, and the Short-horn: the long-horn, in Ireland and the Midland Counties of England; the middle-horn in Scotland and the western parts of Great Britain; the short-horn in the north and east of England.—R. S.

> "About the middle of the last century the cowman came to the house announcing as a remarkable fact that the favourite cow had produced a white-faced bull-calf. This had never been known to have occurred before; and as a curiosity it was agreed that this animal should be kept and reared as a future sire. Such in a few words is the origin of a fact that has since prevailed throughout the country, for the progeny of this very bull became celebrated for white faces."

Special peculiarities are thus generally to be traced to the interference of man, but other modifications are introduced *naturally* to meet certain local circumstances. Thus, although throughout the west coast of England the original character was generally observable, yet differences might also have been detected according as the animal was naturalised to a hilly country or a more level district. The former, being active and smaller, would be better adapted for the hills, whilst we should find the larger and heavier class of stock on the more level tracts. In the course of centuries stock must of necessity undergo certain changes, especially whilst remaining under the care and control of man; but I believe we have in the North Devon cattle a pure descendant of the original breed of the country, modified and improved in character by the circumstances I have named.

The following are the breeds which are chiefly found in the West of England:—The Cornish breed, South Hams, East Devon and Somerset breed, North Devon, the Hereford, and the Shorthorns, the two last being imported; the others, varieties of native breeds.

The Cornish breed are few in number, and are rapidly decreasing. They are fair milkers, coarse boned, very hardy, and do better upon poor and wet lands than better quality stock; but as land is improved and a more civilised system is adopted, they give place to superior stock, for they are in general badly ribbed, light in their quarters, small in size, and with little disposition for fattening. They have been much improved by the use of Devon bulls; but those who keep these cows have little desire for their improvement, as they would be less hardy, and therefore not so well able to withstand the primitive mode of life which they have to lead.

The Herefordshire Cattle have been introduced from their native district by some spirited individuals. The Earl of St. Germans introduced some Herefords into Cornwall many years since. Mr. Lobb, of the same county, has been a large importer of the breed, and he has a fine herd. In the parishes of Dunterton Kelly, Milton Abbott, and Lauhitton, many cross-bred animals are seen. They appear to do well generally, and are liked for coming to heavy weights; and in this respect they are preferred to the North Devon cross, nor are they so liable to be checked in their growth by exposure and wet. This is certainly the testimony of those who have tried them; still the advocates for the Hereford cross are far from numerous, and the success has been chiefly confined to their use with the South Hams cattle, and we shall see the reason for this improvement below.

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* Royal Agricultural Journal, vol. xiv. p. 450.

The South Hams Cattle.—In the south of Devon there is a district known as the South Hams. It is a triangular district, included within a boundary passing from Plymouth through Chudleigh to Torbay, thence by the sea-coast to the former town, and within this line a peculiar description of stock prevail. They are a degenerate and uncared-for class of animals, possessing few points of value, which have been developed by care or attention in their breeding. They are coarse-boned and large-framed cattle, good milkers, hardy in constitution, and come to heavy weight when fattened. This, however, is seldom done, for they are fed almost entirely upon hay and turnips, without any artificial food or corn; and when in fair condition they are sent to market,—indeed, just at the time they would pay best for fattening. They offal very largely, and the quality of the meat is inferior. This character of the breed is nothing more than might have been anticipated, for they are bred in the most indiscriminate manner imaginable, without the least degree of care or judgment. They appear as if they were degenerate Herefords: this, however, is not probable. They have no doubt descended from the same original breed as other West of England cattle, and have become coarse by being kept upon stronger and better land in the south of Devon. It is really sad to see land of such quality as some of that in the south of Devon grazed by cattle of such inferior character.

The use of the Hereford bulls with the South Hams cows has been beneficial in retaining size, also in improving the quality of the meat and their disposition for fattening. Possibly by the selection of their best animals and by judicious breeding they might *ultimately* equal the Herefords, but it is the work of many generations to do this; and I think it will be far more judicious at once to introduce the improved Hereford blood. For the *wetter* districts no cross will surpass the use of the Hereford bulls; but we shall see that another class of stock will be more suited for the drier and more favoured parts of South Devon. Heavy weight is considered desirable, and a large animal is required. Thus the use of the Hereford bulls improves the quality of the meat and increases its weight, whilst they produce a class of stock more easily fattened than the South Hams, and yet very nearly as hardy. The Short-horn cross would in these *unfavourable* districts require more care and shelter than they are likely to get, and the North Devon cross would decrease the weight.

The Short-horn Cattle have been largely introduced into the West of England, and with much success. They have been tried in Somerset, Devon, and Cornwall. In proportion as the climate gets wetter, in the same degree does the Short-horn show a delicacy of constitution unsuited to it. This breed is, of all others, the most highly developed, and cannot endure the hardships to which too much of the stock of the West of England is subjected. They are most valuable to us for the purpose of crossing with our local breeds. They have been crossed with the South Hams cows *with the greatest success,* and are becoming very general favourites throughout the driest portion of the district. The best breeders are very generally adopting this cross, and especially in the neighbourhood of Totness. Mr. Phillips, of Broomborough, near Totness, has some fine specimens of the pure breed ; but I believe he finds that, although the pure Short-horn is not able to stand against the winter storms, yet the cross between the Short-horn bull and the South Hams cow is sufficiently hardy for any *proper* system of farm management, whilst it also possesses much of the early maturity and good quality of the Short-horn. No doubt the Short-horn bulls bred in the county will be superior to others bred in other parts, from being partially naturalised ; but you cannot habituate one of our high-bred bulls to circumstances prejudicial to its character without injury to its stock. The Short-horn bulls are valuable animals, and they cost high prices ; but, when the stock of one man will not justify the expense, two or more farmers may join together and keep a bull between them, but let them secure *quality.* The introduction of a new breed is always difficult of *general* application ; but the use of improved bulls is by no means difficult, especially if some public-spirited men will breed them in the district. It is the *first* cross which is most valuable ; and, so long as the South Hams stock are so general, it is probable that this cross will continue to be preferred ; but, as improvements of the land are carried out, the Short-horn may be more fully and safely introduced.

The East Devon and Somerset Cattle.—These cattle possess much of the character of the North Devon stock, but, from being kept through successive generations on better land, they have more size and bone ; they are also far more symmetrical animals and of better quality than the South Hams. They are chiefly used for dairy purposes, and for this use they are not generally preserved pure. For grazing they are preferred in Somersetshire before the North Devon cattle, as giving greater weight and realising more return for the grazier. They have also been crossed with the Short-horn, and very much advantage has resulted thereby, the cross-bred animal being better filled out on all its points, and altogether a superior grazing bullock.

The North Devon Cattle.—This is a breed of the highest importance—a treasure highly valued in other parts, though in some parts of the West of England not sufficiently cared for. Indeed, when one surveys the history of the North Devon cattle, he is struck with wonder that a breed possessing such high merits should have survived such neglect; for, notwithstanding all its disadvantages, combined with hard climate and poor land, yet we find this stock honoured as the rivals and competitors for public favour with more cherished breeds. They are a small class of cattle, seldom reaching 60 score, and far more generally averaging 40 to 45 score. For aptitude for fattening, for delicacy of touch, the quality of its meat, the small proportion of offal, and the patient and persevering performance of field labour, they are second to no breed. The Short-horn may under some circumstances equal the Devon for fattening and exceed it for weight, but in every other respect it is inferior, and for its *combined* qualities there is no breed which can equal the North Devon cattle. They do not attain the heavy weights of some other breeds, *nor is it desirable they should*, but they do not consume so much food. I do not doubt but that a North Devon bullock will produce as much beef from a given quantity of food as any other breed; and in the many trials which have been made the North Devons have invariably maintained an honourable position. Doubtless there are circumstances under which the North Devons will have to yield to the Short-horn, and these circumstances will define their relative districts. The North Devon would lose its specific character if it could be brought to the weight of the Short-horn, whereas the latter breed would be depreciated in value by a decrease of size. They have each their own peculiarities, and these fit them for different purposes, and especially for crossing with other stock. If an animal is required to possess early maturity and quality *without decreasing the size*, then the Short-horn may be selected, provided the climate and management are favourable; but, under less favourable circumstances, the Hereford may be used with more advantage. The use of the North Devon gives similar advantages in a form more suited to the western side of the island.

There are large districts through England quite unsuited for heavy animals, and hence the North Devons will often *fatten* when a Short-horn will scarcely gain flesh; and the Devon can claim this district without fear of meeting with a successful rival. *It has yet to be shown* that heavy cattle will produce more beef in grazing our *best* quality land than the larger number of North Devons which it would carry. The number per acre must be considered as well as the weight to which the animal is brought. The avidity with which graziers of the Midland counties—even in the Short-horn districts—purchase our *inferior* North Devons leaves a strong impression on my mind that the trial with other breeds for producing the greatest amount of beef from the same keep would not be unfavourable to the reputation of the North Devon cattle. I am bound to add that in Somerset a different opinion is entertained, for the North Devon cattle are not thought sufficiently heavy, and are viewed rather as choice for their quality than profitable for the weight produced.

The North Devon cattle vary as much as any breed I know, according to the care taken of them and the judgment with which they are bred. The average quality of North Devon stock in our fairs some fifty years ago was *far superior* to that of the present time, and the general stock upon the farms was of a much higher standard. Indeed, we may naturally inquire what other result could have been anticipated. Vancouver, in his Report on the Farming of Devon * in 1808, refers to the then declining character of the general stock of North Devons, and he traces it to two causes—" the great demand which has been made for these cattle from other parts of England where the purchasers spare neither pains nor price to obtain those of the highest proof and beauty," and also from breaking up the best pastures.

The preservation of the North Devons in all their purity and quality may be traced to the late Mr. Francis Quartly, of Molland. At a time when the breed was being rapidly drawn from its native soil, he purchased the choicest cows he could procure, and, as far as the extent of his farm would allow, he retained the best specimens of the North Devon blood. Some of his neighbours followed his example to a small extent, but no one equally distinguished himself, or could put in such a claim as he could for the grateful remembrance of those interested in this the most important agricultural produce of North Devon. The 'Devon Herd Book' † records the pedigree of the best North Devon stock which is now so widely scattered throughout the world, and shows how much may be traced to this source. The large numbers which were purchased from the North of Devon in bygone years—where are they? Our Herd Book contains little record of them. I have carefully analysed the Herd Book to trace out, if possible, the original parents of this breed, and the following is the somewhat curious result. I have confined myself to the bulls, as indicating the best blood and the most careful pedigrees :—

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* Page 329.

† By Mr. J. Tanner Davy.

	Bulls.	Descended from Prize.	Quartly Blood traced only on Dam side.	Bulls not traced to Quartly.
Vol. 1 contains	132	of these 108	7	17
„ 2 „	213	„ 180	8	25
	345	288	15	42
		15	—	—
Traced to Quartly's herd =		303		

We speak of Highflyer in the Stud-book and of Hubback amongst the Short-horns, but the North Devon stock can boast of Prize with equal justice and pleasure. The Herd Book gives but little record of Prize, it simply says :*—

> "PRIZE (108), bred by Mr. Quartly of Molland, and sold to Mr. Child of Kinlet, Worcester."

Here is the ancestor of a noble race, but much of his honour was gained by a descendant of this bull, which is far better known, viz. Forester; he is recorded in the Herd Book † as,—

> "FORESTER ‡ (46), calved 1827, bred by Mr. Quartly, of Molland. This was a very celebrated bull; sire, Symmetry, bred by Mr. Quartly; his grandsire was a son of the noted bull Prize (108), bred by Mr. Quartly and sold to Mr. Child of Kinlet; dam Tulip (451); grandam and great-grandam bred by Mr. Quartly."

This certainly appears to me to give additional proof to the justice of the public testimonial presented to the late Mr. Francis Quartly not long before his death; and every one connected with the prosperity of the district must feel that he has imposed a debt of gratitude upon the North of Devon which can never be removed. It has been justly said by Mr. Acland, in his Report on the Farming of Somerset, §—" It is remarkable how entirely the reputation, and it may be said the present existence, of the Devon breed is owing to the tenant-farmers, and, above all, to one man, Mr. Francis Quartly." The North Devon breed is truly the *tenant* farmers' breed; the Short-horn is the *landlords'* breed. The one has had to struggle against small capitals and poor keep, the other has been perfected by the command of abundant means and liberal systems of management.

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* Davy's 'Devon Herd Book,' vol. i. p. 12.

† Davy's 'Devon Herd Book,' vol. i. p. 6.

‡ Forester was sold as a yearling to the late John Knight, Esq., and turned out on Exmoor to run with the stock on the moor. Mr. Francis Quartly some months after, requiring an additional bull, went to purchase him back again from Mr. Knight's agent. This bull was the only bull of pure descent which Mr. Quartly could purchase, and as the bull did not look very thriving (probably from the exposure and rough weather), he was purchased at a low price. On his arrival at Molland he took the name of "Forester;" but here he soon improved, and became a general favourite; and the 'Herd Book' bears evidence of the extraordinary good which this bull produced in Mr. Quartly's herd.

§ Royal Agricultural Journal, vol. xi. p. 680.

Many of the best breeders of North Devon cattle reside in the district around North Molton. Amongst these are Messrs. James and John Quartly, James Davy, J. T. Davy, Halse, W. Hole, R. Mogridge, J. Merson, and Passmore. In other parts of Devon, Messrs. G. Turner, of Exeter; J. Bodley, of Stockleigh Pomeroy; and Perry, of Okehampton,—have good herds of this breed. In Somerset, Messrs. Farthing and Morle, of Bridgewater, and James Hole, of Dunster, have good reputation as breeders.* This breed has certainly many specimens of first-class character now remaining; but, if ever the breed of North Devons is to be brought to perfection, it must be taken up more generally by persons possessed of wealth. His Royal Highness Prince Albert has recently established a herd of *first-rate quality* at Windsor, and, no doubt, improvement will be manifest soon. It is to the *large* herds of Short-horns which have been kept that much of their improvement is due. This gives greater opportunity for remedying in the bull the weak points of the cow, and we can also regulate the pedigree with more judgment.

We are all familiar with the perfection to which the Short-horns have arrived, and how high the prices have continued from the sale of Comet in 1810 for 1000 guineas, to the sale of Grand Duke in 1856 for 1000 guineas, and of Master Butterfly in 1856 for 1200 guineas. The sale of cows and heifers has been similar; some of them fetched in 1810 from 400 to 410 guineas each, and in the recent sale of Earl Ducie's Short-horns, calves realized the sums of 600*l.* and 700*l.* Can it be imagined that "*fancy*," or a "breeding mania" alone, can during half a century mislead our largest, our best, our most intelligent and observant breeders, and yet that the experience of 50 years has not proved to them their error? Rely upon it that it is not "fancy:" we are too apt to value our *breeding* stock as so much *beef* rather than as the perpetuators of good or bad characters and dispositions.

This is a matter of considerable importance to those engaged in the rearing of North Devon stock. *Why should a prize bull at our Royal Agricultural Society shows, of the Short-horn breed, sell for twenty times as much as a prize Devon bull?* † Let the breeders of North Devon cattle give a reply *and profit by it.* It is not because *the quality* is inferior; this is disproved by the records of our Smithfield cattle show, which in the same year as the above occurred decided that the *best* animal shown was a North Devon. No one was surprised at the decision, because it had happened so many times before. It cannot be that they are descended from stock *originally superior*, for the history of Hubback will prove this. This is the bull from which the best Short-horns have descended and from which breeders like to prove descent. The dam of this bull belonged to a person in humble circumstances who grazed her upon very poor common-land. She was afterwards put upon land of better quality, and then she failed to breed because she got too fat. Before this she had a bull-calf, which possessed much of the kindly feeding character of the dam; and as he grazed with his dam, Mr. Waistell, of Alihill, rather took a fancy to him from frequently riding past the field, and at length he attempted to purchase it from the owner. The price asked, 8*l.*, seemed much for a calf not a year old, and the bargain was not struck. Still he longed for the young beast; and happening to meet Mr. Robert Colling, he asked his opinion of the animal. Mr. Colling acknowledged that there was something good about him, but there was something in his manner which induced Mr. Waistell to suspect that Mr. Colling thought somewhat more highly of the calf than his language expressed, and therefore he hastened the next morning, concluded the bargain, and paid the money. He had scarcely done so before Mr. R. Colling arrived for the same purpose, and as the two farmers rode home together they agreed that it should be a joint speculation. Some months passed by and they transferred the calf to Mr. C. Colling, who confined his use *most strictly* to his own stock, and being a *small* bull, with flesh, hide, and hair of excellent quality, he was calculated for improving Mr. C. Colling's stock.* There is nothing here in the ancestry of the Short-horns which the Devons cannot surpass, for it is clear that the size, which is now the chief point of difference, was not originally possessed by them. The cow was one of a neglected and little valued class, possessing some good qualities but nothing extraordinary.

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* The excellent animals produced near Wiveliscombe, combining "size and quality," should not be forgotten in this enumeration.—ED.

† The answer is plain. Because the Devon, as an animal to breed and rear, will do best AT HOME.—R. S. Therefore the demand for *breeding stock* of the Devon

To what can we refer the difference in value which has been set on these two breeds by *practical* men in England, Ireland, America, France, and Australia? It is folly to blind ourselves

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blood is limited. Probably as the farming improves in Wales and Ireland, and other moist climates, the market for Devon bulls and heifers will be improved. There is at present no practical limit to the sale of good Devon steers to graziers except that of distance from their birthplace.—T. D. A.

* 'Cattle,' by Youatt, p. 229.

by referring it all to *prejudice*; rather let us see if we have not a breed which is capable of surpassing them on every point. Such results cannot be realized unless the system is altered. If we except *a few small and select* herds of cattle, the remainder are annually *getting worse.* With these exceptions I may say that the breeders are chiefly small and poor tenants, generally selling the best they have because it is most marketable, and keeping the worse to breed from, instead of the reverse; and so little do they try for improvement that a difference of 5*s.* between the cost of using a good or a bad bull would generally lead them to choose the latter. It has been truly said, "our friends tell us of our faults, our enemies flatter us." I state my conviction that the North Devon cattle are rapidly deteriorating in quality, and simply from *neglect* and *indifference.* The few producers of the best stock sell them to go out of the country, because they can realize far better prices from strangers than from any in the district. North Devon stock may now be secured, which will, under good management, place the breed in a very different position. There is no district where they can be produced more successfully than their native hills, *and here it should be done.*

I shall, before leaving this topic, refer to the two causes which I believe place the Devons in their present disadvantageous position. The first is the close relationship of blood between the stock used for breeding, which must lead to a small and imperfect produce, for a systematic change of blood is necessary for full development. We can only surmount this difficulty by the establishment of distinct families, and this is difficult for a *small* breeder to succeed in doing. The other cause above referred to is the poor and illiberal mode of rearing young stock. Observe the different systems adopted in the two breeds. If we except a few select herds, the Devons scarcely know the taste of new milk after they are six weeks old, and the substitutes afterwards used are small in quantity and inferior in quality, and the calf, when it becomes twelve months old, looks a poor half-starved animal compared with a Short-horn calf of the same age. It is not the early maturity of the Short-horn herd which does this, for the North Devon is equally capable of early maturity under a right system. The Short-horn calf, so far from losing the cow's milk when six weeks old, probably receives the milk of a second cow in addition, if the dam's milk is not enough for it. Besides this, it receives cake and corn to further its growth when it is able to consume it; and thus they place at the animal's disposal so much nutriment that it is *fully developed* in every part, and during every stage of growth it has all it requires; hence, in the one case, we have a fully formed animal, and the other is checked in its growth and rendered imperfect. It would be interesting to see a well-bred Short-horn calf treated under each of these systems; the contrast would convince any one of the error of the present system. It is not simply in the case of one animal, but the continuance of this liberal system through successive generations, which has made the Short-horns well nigh perfect, and enabled them to command such high prices in the market. I should rather suggest that instead of the present system it would be desirable to wean the calves from their dam when two weeks old, and put them to suck a half-bred Guernsey, or any other good milch cow, and then let both cow and calf have *good* keep and plenty of exercise. Such a system as this, well followed up, would soon alter the character of the North Devon stock and enable them to develop qualities which are now lying latent.

For dairy purposes we have in the West of England many varieties, and amongst them I may mention the Guernsey, Alderney, Long-horns, Short-horns, South Hams, Cornish, Welsh, Herefords, Ayrshires, North Devons, and the Somerset Devons. As the object in the majority of cases is simply the production of milk, breed is generally quite disregarded; in fact, we shall have occasion to notice subsequently that high-bred cows are almost invariably inferior milkers. The favourites as dairy cows are the common bred Short-horns, the Ayrshires, and the South Hams cows. The little Cornish and Welsh cows are useful milkers, but their number is inconsiderable, and in other respects they are of inferior character. Guernseys are liked for quantity of milk, whilst the Alderneys are preferred for quality and colour of the butter. Numerous crosses have been made; that between a Short-horn bull and the Guernsey cow has been most marked and very successful; also between the Guernsey bull and Devon cow. The produce has in each case possessed good milking character combined with great aptitude for fattening. In effecting any improvement in the dairy cows of any district we must operate upon the stock which may be in the locality, and it is altogether useless to recommend the introduction of breeds from a distance. We must have some definite object in view, and if we wish to produce good milkers we must either introduce a cross from a variety thus characterized, or else we must select calves from the best milkers and use with them bulls descended from good milch cows. Many will be disposed to doubt the fact of a bull giving a milking character to his offspring; but I am convinced of its correctness, and I have every reason to believe that an oversight of this point has led to much injury amongst our improved breeds. The possession of a milking disposition is not at all contrary to an aptitude for fattening, but they rather require similar conditions; hence any improvement in this respect is in no way prejudicial, but on the contrary is decidedly beneficial, and will prove an important additional qualification in any improved breed of cattle.

THE PHYSIOLOGY OF FOOD.

I now propose to enter upon a consideration of food, and to trace it through its stages of preparation and distribution until it is finally absorbed and becomes part of the body of a living animal. Thus we shall have a full opportunity of seeing those beautiful transformations which convert vegetable produce into animal structure, capable of performing all the functions of life. In the performance of these functions we have an agency usually recognised as "vital action," which calls for a comment before entering into the following details. The *communication* of animal life is wrapped in mystery, but the *functions* of life are under our observation. Many of them have been investigated, and their mode of action is known to us, but very much yet remains to be discovered. I am now especially desirous that the reader should consider the term "vital action," rather as the discharge of the functions of separate and independent organs, than as any mysterious force acting upon the animal system. The result of all investigations has been to show a uniformity of action, and that the laws of nature which govern matter have a universal operation.

By the aid of chemistry we have arrived at a knowledge of the materials which compose the principal kinds of food, and also the uses of those several component parts. All may be arranged under two classes, according as *nitrogen* does or does not enter into their composition. Those bodies in which nitrogen is present are distinguished as *nitrogenised* matter, and the following are the principal representatives of this group which were found in food:—Vegetable fibrin, vegetable albumen, and vegetable casein. These possess a great similarity of composition, and we find their counterparts in the fibrin, albumen, and casein of the animal body. Investigations undertaken with much skill and care lead us to the conclusion that by the aid of vegetation certain compounds are *prepared* during the plant's growth, which are actually ready to be *transferred* to the animal body for the promotion of its muscular growth, and we shall have an opportunity of seeing that the growth of the body is entirely dependent upon them. The peculiar duty of these nitrogenised compounds is the development of the muscles and tissues of which the body is built up, and the discharge of this duty is known as the nutritive function of food. In fact, the *nutritive* value of food is entirely dependent upon the presence of these substances, for without them growth is impossible.

The functions of life cause *a constant waste* of the body in proportion to the activity of the animal, and the greater this waste may be the greater is the activity of the system, not simply to replace the parts thus used up, but to render them more fully developed: hence exercise, although causing a waste of the body, really tends to its increase if we assume that food is plentifully supplied. The absence of these elements of nutrition in the food will not admit even of the body remaining stationary, for as the functions of life *must* continue, thereby causing a waste of the body without the possibility of forming it again from the food, the animal sinks into an emaciated state. Those parts of the body least required are the first used to give strength to those more actively employed, and when these fail vitality soon ceases, from its organism being completely worn out. Some experiments were tried by Chossat to determine the extent of decrease which the various parts of the body would suffer in case of starvation, and the following are the results:—

1000 parts of	fat lost	933
,,	blood lost	750
,,	milk lost	714
,,	liver lost	520
,,	heart lost	448
,,	intestines lost ..	424
,,	muscles lost	423
,,	bones lost ..	167
,,	nervous system lost	19

Other experiments have been tried for testing how far an abundant supply of food, destitute of the nitrogen compounds, will support life, and in these cases we find death even more rapid than without food. A knowledge of these facts proves very clearly that the presence of the nitrogen compounds determines the *nutritive* value of food, and it has led our scientific investigators to examine the proportion of these substances in our principal articles of food, thus giving us some approximate idea of their relative feeding value, and from various experiments we may calculate the value as indicated by practice. The following Table has been compiled by Dr. Voelcker, and published in greater detail in Morton's 'Encyclopedia of Agriculture:'—*

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* Vol. ii., p. 474.

Articles of Food.	Percentage of Water.	Percentage of Nitrogen.	Proportion of Nitrogenised and Non-nitrogenised Matter.	Nutritive Equivalent.	Value as shown by Experiments.
dow hay	11·	1·15	..	100	100
erne	16·6	1·38	..	83	95
clover hay	10·1	1·54	1 to 6·08	75	96
clover, green	76·	·64	..	311	435
straw	18·7	·24	1 to 24·4	479	355
straw	21·	·30	1 to 12·5	383	220
ey straw	11·	·25	1 to 29·3	460	210
at straw	26·	·27	1 to 14·2	426	282
straw	8·5	1·79	..	64	159
kwheat straw	11·6	·48	..	240	200
il straw	9·2	1·08	..	114	160
hes mown in bloom and ied	11·	1·04	..	101	112
to stalks	76·	·55	..	209	300
gold leaves	88·9	·5	..	230	605
ot leaves	70·9	·85	..	135	..
les	91·	·17	..	676	262
gold wurtzel	..	..	1 to 7·26	391	346
te Silesian beet	85·6	·18	..	669	..
ots	87·6	·30	1 to 7 84	382	297
toes	75·9	·36	1 to 9·	319	195
toes kept in pits	76·8	·30	..	383	400
hes (seed)	14·6	4·37	..	26	44
s	7·9	5·11	1 to 2·8	23	46
	8·6	3·84	1 to 2·14	27	44
ils	9·	4·	1 to 1·87	29	..
n corn	18·	1·64	1 to 6·55	70	55
wheat	12·5	2·10	1 to 6·05	55	64
y	13·2	1·76	1 to 4·25	65	51
	12·4	1·92	1 to 4·08	60	58
	11·5	2·	1 to 4·42	58	48
at	10·5	2·09	1 to 2·42	55	43
	13·8	2·3	..	50	..
	13·4	1·2	1 to 14·8	96	..
eed cake	13·4	5·20	..	22	64
cake	10·5	4·92	..	23	..
p cake	5·	4·21	..	27	..
y cake	6·8	5·36	..	21	..

he nutritive equivalents shown above are supposed to be al to each other: thus, for example, 21 lbs. of poppy cake equal to 27 lbs. of hemp cake, and these are each equal to bs. of rape cake, or 22 lbs. of linseed cake, for the forma- of *flesh*, not fat. These results must be looked upon rather approximate than positive, and we have yet to test these lts by careful experiment both in the laboratory and in the l; still they illustrate the variation which exists in various ling matters, and give us a general idea of their real worth.

here is another class of compounds used as food, and these distinguished by *the absence of nitrogen* and are named the *nitrogenised* constituents of food. The representatives of this class are, fat, starch, gum, cane-sugar, grape-sugar, sugar of milk, pectine, alcohol. The use of these compounds is for maintaining the heat of the body and for supplying the muscular tissues with soft oily juices, which will lubricate them and render their action smooth and pleasant. Cattle have bodies warmer than the air around them, for whilst their temperature generally ranges from 95° to 105° Fahr., the surrounding atmosphere may vary from 20° Fahr. and upwards, and in the South of England it will average about 50° Fahr. throughout the year. Hence, as these animals are much warmer than the air, they lose a considerable quantity of heat. The heat of the body must be kept up to its proper standard, and it is one office of these ingredients of the food to perform this function.

When these compounds are present in larger proportions than is necessary for maintaining the heat of the body, then nature makes a store *in the form of fat*, consequently heat-producing and fat-producing substances are identical; but as the former must be fully satisfied before the latter can claim a share, it is clear that as we lessen the demands for heat the greater will be the *surplus* remaining for the formation of fat. We shall have occasion to go into this subsequently, and I shall therefore content myself with this passing notice. Dr. Playfair has compared the use of food in the animal body to the combustion of fuel in a furnace. He says,* "The body is the furnace, the food is the fuel, the excrements are the ashes, and the gases expired from the mouth are of the same composition as those which fly up the chimney of the furnace." Both the nitrogenised and non-nitrogenised components of food are accompanied with certain inorganic matters essential for their growth, and these ingredients are appropriated in the animal economy for the formation of the skeleton. With this very cursory notice of the composition of food and its uses, I shall proceed to trace the changes which the food undergoes in the support of life and the perfect development of the animal body.

The first process the food undergoes after it is gathered by the animal is the *mastication*. Cattle are *ruminants*, that is they "chew the cud," and hence with them the process of mastication is rather complicated. The food is swallowed by animals of this class with but little mastication; in fact, it is simply gathered into little pellets to facilitate its swallowing, and in this state it passes into the stomach. The stomachs of the ruminants differ from all other animals in consisting of *four* separate compartments or stomachs. The rumen is by far the largest of the four stomachs, and it is furnished with strong muscular bands, which act as supports to avoid the danger of the stomach being injured from the weight of its contents being more than the strength of the coats of the stomach could bear. It is into this spacious compartment that the food is collected, and as soon as it is full rumination commences. As rumination does not commence until the rumen becomes full, we see the necessity for food being *bulky* as well as nutritious. An animal might have the nutritive and heat-producing elements of food given to it in such a *concentrated* form that they could not be digested, and hence the animal would pine away from starvation, whilst receiving all the food necessary for its support, because it is not of sufficient bulk to allow the functions of digestion to be properly performed. Rumination is commenced by some of the food being passed into the second stomach * or reticulum; from thence it is thrown into the mouth for mastication. Judging from the position of the rumen, we should be disposed to imagine that the food which would be re-masticated prior to any other would be the last portion which the animal had swallowed, for this, we might have anticipated, would have been at the mouth of the rumen, and therefore most readily passed away again. Such, however, is not the case, for it has been shown that, by means of the peristaltic motion of the stomach, the food performs a circuit before leaving the rumen, and that the food which is first allowed to pass away from this stomach is that which was received into it first, and hence would have become most softened and thereby better prepared for the process of mastication.

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* Royal Agricultural Journal, vol. iv. p. 221.

Mastication is a double operation, for it has both a mechanical and a chemical action. The former is *a grinding process* by which the food becomes broken and its parts thoroughly severed, thereby preparing it for the decomposition it has subsequently to undergo. During this grinding, which is produced by a lateral motion of the jaws, there is a fluid poured into the mouth from the salivary glands, which are excited by this action of the jaws. This fluid is known as *the saliva*, and during the mastication of the food it becomes intermixed with it, thereby rendering it a *soft* pulpy mass, and this is another step which facilitates its future changes. This saliva has a chemical action, for, being somewhat dense in its nature, it forms numberless small bubbles, each of which contains some atmospheric air, and thus amongst the soft pulpy food we have a considerable quantity of air carried into the stomach. The atmospheric air contains oxygen, which being a powerful decomposing agent, the elements of change are thus introduced into the food. We may gather from this a hint not to be too forward in assisting the operations of nature by cutting the food too small. If it is desirable that the animal should consume its food *rapidly*, we may take the liberty of aiding it, still it is an encroachment; but where it is the business of the animal's life to consume and appropriate its food we should be more cautious. There is much injury done by finely dividing the food intended for cattle, as it decreases the mastication and the consequent salivation of the food.

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* Upon this point our veterinary authorities are divided.

When the mastication is thoroughly completed, the food is again swallowed; but now it descends into the third stomach, which is named the omasum, and it will be observed that whilst the food in the first swallowing took a straight course, it is now diverted to the left and passes into the third stomach. This stomach is often named the manifold, from the large number of folds which it contains, and in cattle there are generally 80 or 100 of these folds. It is evident that this stomach must present a very large amount of *surface*, in consequence of the folds which this arrangement of its lining produces, and it appears that this is a very important condition, for a fluid is secreted by the coat of this stomach for the purpose of more fully softening or macerating the food received into it. The food here becomes finally prepared for the chemical process of digestion, and then passes into the fourth stomach. This is the true digestive stomach, or the abomasum. Here we shall observe the commencement of a series of chemical actions most beautifully arranged, for converting the produce of the vegetable kingdom into well-developed animal matter. In the calf we do not find these *four* stomachs brought into action, for its natural food, milk, does not require any of that preparation which is necessary in the case of solid food, and hence we find the first, second, and third stomachs imperfect. The milk upon being swallowed passes immediately into the fourth stomach, where the process of digestion takes place. This stomach in the calf is commonly known as "*the rennet*," and it possesses the singular property of coagulating (curdling) milk, whereby it is retained in the intestines for a longer period, and more fully acted upon than if it had remained in its liquid state.

The digestive action of the fourth stomach is referable to the secretion of a fluid by the coats of the stomach by which a chemical change is induced in the food. This fluid is *the gastric juice*. When it passes into the stomach and finds no food upon which to act, it irritates the stomach and causes the feeling of hunger. The gastric juice contains several acids, which by their action soften the hard and otherwise indigestible portions of the food. This process is known as the *chymification* of food, and the food thus prepared is known as *chyme*. The food is now ready to leave the stomach, and it is gradually passed into the intestines to undergo further change. The chyme which passes out of the fourth stomach enters the duodenum, and into it the pancreatic juice and the bile are poured. These juices are secreted by the pancreas and the liver respectively. When the chyme left the stomach it had an *acid* character, in consequence of the acid it had received from the gastric juice; but by the juices here introduced, and which contain *alkalies*, we have a powerful chemical action promoted, known as *chylification*. By this process the chyme is converted into a white liquid, or *chyle*, and in this state it is prepared for yielding nutriment to the system. Its white colour is due to the globules of fat which it contains. The chyle differs but little in composition from blood, it is, however, free from hæmatosin which gives blood its deep red colour. During the passage of the chyle through the duodenum the process of chylification becomes completed, and thence the chyle passes into the small intestines.

The small intestines are of very great length; they present a twisted appearance, and the consequence is the food takes a considerable time in passing through them. These intestines are provided with a peculiar lining, which is covered with a series of small projecting absorbent vessels. These are covered with a membrane, which consists of a vascular network of extremely small capillary vessels. There are no *apertures* through this membrane, but in common with other animal membranes it admits of the passage of liquids through it. In order that I may be clearly understood upon the manner in which animal membranes act, it is necessary for me to refer to the passage of liquids through them. This is termed *endosmose* when it flows inwards, and *exosmose* when it flows outwards. To illustrate this take a piece of moist bladder or other fine animal membrane, and having securely covered the end of a glass tube with it, put into this tube a solution of sugar or salt. Place this tube into a vessel containing pure water. A change is soon observed; the liquid in the tube will rise, showing the passage of water into the tube; but an examination of the outer vessel will indicate the presence of sugar or salt, whichever may have been used, proving that there has been *an exchange of fluids through the membrane*. If, however, instead of pure water in the outer vessel, we have any other matter dissolved in it, say for instance, lime, then we should find that whilst the one solution *passed out*, the other solution had *passed into* the tube. It is upon this principle that the various membranes of the body act, modified in some measure so as to perform their special functions.

I have traced the progress of the food until it became *chyle*, in which state we noticed its passage into the small intestines. The numerous projecting villi which exist on the lining of these intestines immediately come into action, and we find these vessels absorbing, from the mass now present, the matter which has been brought there for absorption. These absorbent vessels are the lacteals, and by them the purified chyle is conveyed to the mesenteric glands, and by these to a reservoir named the receptaculum chyli. It is now passed by the thoracic duct along the side of the spine until it is conveyed to the heart. Before the chyle reaches the heart it receives the lymph, which has been absorbed by the lymphatic vessels. The function of these vessels is to carry again into the circulation any nutritive matter which may have been conveyed to the various organs of the body above what they required for their support and development. By the lacteals we find the food deprived of its soluble matter, and as the small intestines are very long, they have abundant opportunity for fully abstracting from the food all it may contain of any value for the support of animal life. The matter remaining passes through the large intestines, and is finally ejected from the body, being now valueless to the animal.

In noticing the conversion of food into nutritive matter for the support of animal life, a reference was made to *the bile*, and this demands some further notice before leaving this part of the subject. The bile is secreted by *the liver*, the largest gland in the entire system. Its office is to separate from the impure venous blood the superfluous carbonaceous matter it contains, and thus this matter, which has acted its part in the animal economy, is separated from the blood before it enters again into the general circulation of the system. As we shall find it necessary to refer again to this action of the liver, it is only necessary for me to state the function it discharges. The bile which is secreted by this gland is strongly alkaline, and contains a large quantity of soda, together with the carbonaceous matter, which is a valuable chemical agent in completing the change of *chyme* into *chyle.**

I have now to leave *the digestive* organs, and proceed to notice that *circulating* system, which distributes the nourishment which the former has prepared, so that each part of the body may be enabled to appropriate for its own development those materials which it may require. The circulation of the blood is of a twofold character; in fact, two circles are completed in its movement. This movement of the blood is effected by the action of the heart. The heart is a large and very perfectly developed muscle, possessing a power of motion entirely involuntary, so that like other muscles of the same class its action continues without any volition of the mind. It is enclosed in a bag named the pericardium, which contains a liquid which facilitates the performance of its functions. The heart consists of four compartments; the two compartments at the top are known as the right and left *auricles* respectively, and the two portions below are distinguished as the right and left ventricles. In its action it may be compared to a *double* force-pump, the right auricle and the right ventricle forming one pump, and the left auricle and the left ventricle the other. The right portion of the heart is devoted to the lesser or *pulmonary circulation*, whilst the left side carries out the *systematic* or general *circulation*, and to these distinct circulations of the blood I shall now draw your attention.

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* Some recent discoveries have thrown new light on the action of the liver, proving the existence in that organ of a process for the production of sugar, which again disappears in the lungs.—ED.

The pulmonary circulation commences in the right auricle, which receives the dark and impure venous blood, and also the chyle which the digestive organs have prepared from the food, which having been collected by the absorbents is conveyed by the mesenteric glands and thoracic duct, until it reaches the right auricle. Here then is the receiving apartment into which the blood, after it has performed its circulation and become charged with carbonaceous matter, the waste and impurities of the system, comes to undergo a course of preparation, which will fit it for going through the circulation again. The nutritive matter of the food here intermixes with the blood to supply its exhausted power of nutrition, and all that afterwards remains is to free it from its impurities.

Before, however, we enter upon a consideration of the changes which blood undergoes, it is desirable that we should know its composition.

Analysis of Blood by Monsieur LECANU.

Water	78·5
Fibrin	·6
Albumen	6·9
Colouring matter	11·9
Fat	·6
Extractive matter	·1
Ash	1·2
Loss	·2
	100·0

Each of these ingredients of blood has a distinct office to fulfil in the animal economy, and it will be necessary to refer to them from time to time in the further consideration of our subject, as each may come into action.

The venous blood, as it enters the right auricle, is of a dark purple colour and loaded with impurities which render it unfit for further circulation in the body. It has therefore to undergo a course of purification, and this is the function the pulmonary circulation has to perform. An opening communicates between the right auricle and the right ventricle, which is immediately below it, and thus by a slight contraction of the muscular coat of the auricle the blood is passed into the ventricle. From the right ventricle it has to be forced through the lungs, and back again to the other side of the heart; and hence the right ventricle of the heart may be considered to be a force-pump, driving the blood through a series of tubes, and having traversed a considerable distance, it returns again to the left side of the heart. This is the pulmonary circulation, or the passage of the blood through the lungs, and being a most important operation, it needs more detail to be given respecting it.* The dark-coloured venous blood had gathered carbonaceous matter in going through the system, and this has combined with the colouring matter of the blood and changed its character. This colouring matter consists of very minute globules, so minute indeed that they can only be distinguished under a powerful microscope, and it has been calculated that they are about $\frac{1}{3006}$th part of an inch in diameter. These globules contain a colouring matter named *hæmatosin*, which is a compound of an oxide of iron with some of the protein compounds, and it is to the action of the iron it contains that its very important functions may be traced.

Iron is capable of forming *two* oxides according to the relative proportions of iron and oxygen which may be present. The highest or most perfect oxide is that which it is most disposed to form, and it is known as the *per* oxide ($F_{e2}\,O_3$), but in the presence of carbonic acid it has a disposition to become changed into a carbonate of iron ($F_e\,O,\ C\,O_2$). This change takes place in the venous blood, and thus we have the *per* oxide of iron, which is a bright red, turned into carbonate of iron, which gives the blood its dark colour.

The venous blood on leaving the right ventricle of the heart passes into the lungs. The lungs are the organs of respiration, and consist of two distinct parts; each lung is subdivided into lobes; the right lung has four lobes, and the left lung has three lobes. The lung consists of an immense number of small air-cells, held together by a tissue named the areolar tissue. These air-cells receive their supplies from the windpipe, which divides and subdivides into innumerable small tubes which connect themselves with these cells. The arrangement for the distribution and supply of air is most perfect. The venous blood is carried to the lungs by the means of the pulmonary arteries, which gradually divide and subdivide until they become exceedingly small. These minute passages are named capillaries from their *hair*-like dimensions, and by these vessels the blood becomes very completely distributed over the air-cells of the lungs. This complete division and exposure of the blood to the air contained in the cells of the lungs results in a powerful and most important chemical action which quite changes the character of the blood. It arises from a combination of the oxygen of the air with the protoxide of iron which forms a part of the carbonate of iron which exists in the venous blood. The change is thus shown:—

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* See also article by Professor Simonds, in Royal Agricultural Society's Journal, vol. x. p. 585.

Carbonate of iron consists of { Carbonic acid—which becomes free, and
{ Protoxide of iron } then forms *per* oxide
Oxygen of the air is added Oxygen } of iron.

This arises from a strong attachment between the oxygen and the protoxide of iron as shown in its constant desire to become the perfect or *per* oxide. The result of this change, therefore, is that the blood, instead of containing the carbonate of iron, now contains the *per* oxide of iron, whilst carbonic acid becoming free passes away in the breath. This is proved by analysis of the air drawn into the lungs and the breath thrown off from them, by Professor J. F. Johnston:—

	Atmospheric Air drawn into Lungs.	Analysis of Breath.
Nitrogen	79·16	79·16
Oxygen	20·80	16·84
Carbonic acid	·04	4·00
	100·00	100·00

The nitrogen thus takes no part in the change, but as the oxygen is decreased the carbonic acid is proportionately increased. This chemical action has not only removed the carbonic acid, but it has introduced oxygen into the hæmatosin of the blood, and the consequence is, it has resumed the bright red colour which it derives from the per oxide of iron. This completes the action of the lungs, and now the blood returns charged with oxygen and ready for circulation through the system. Boussingault has determined that a cow expires daily 70 oz. of carbon in this manner. It is a change of the deepest importance, and may be considered one of the foundation-stones of the animal structure.

Thus far the blood has been undergoing a course of *preparation*, but now it has to be carried into every part of the body and to be appropriated for the maintenance and further development of the body. This circulation is termed *system*atic, from the blood being thus carried throughout the entire system. The blood in returning from the lungs enters the left auricle, which is a sort of antechamber from which the blood, by a slight muscular action, is passed into the left ventricle below. Upon this portion of the heart by far the greatest amount of labour devolves, for whilst the right ventricle pumped the blood into the lungs and assists it back again to the heart, the left ventricle has to force it over a much larger distance in passing it to every part of the body. Here, however, is a special provision, for the muscular development of the left ventricle is considerably increased.

By the powerful contractile force of the left ventricle the *arterial* blood, as it is now called, is forced through the aorta into the arteries and thence throughout the entire system. In a healthy ox this takes place about 40 times in a minute, and in this manner, in a full-grown bullock, about 80 lbs. of blood has to be pumped through the arteries. These arteries, as they extend through the body, gradually send off branches which reduce in size and increase in number until we find them of the most minute dimensions, and as such are distinguished as the capillaries. Many of these capillary vessels are *considerably smaller than hairs*, and they play a most important part in the system, for through them every part of the body receives its nourishment, and all the secretions are formed from them. The arteries and veins are the larger communications from and to the heart, but these are the real builders of the body. When the blood is becoming rather too dense for passing through them and dilution is necessary, we have the feeling of thirst produced, which can only be satisfied by the introduction of water into the system. This invigorating stream of arterial blood is thus most completely diffused throughout the system, and every organ is thus supported and prepared for its duties. Each of these organs receives a double supply, the one for its development, and the other upon which it has to discharge its functions, it may be of secretion, or purification, or circulation.

Having traced the blood through its various stages of preparation and circulation, we are now in a position to inquire how the materials contained in the arterial blood become changed into parts of the animal body, as flesh, bone, fat, &c. There is in blood a substance known as *fibrin*, which may be separated by beating it with a small bundle of twigs. It is devoid of all colour, and when examined under a powerful microscope it is found to consist of a number of *kernels* (named kernel fibres), which readily attach themselves together and appear like minute pearls threaded upon a string. These individual fibres become united into small bundles, and these bundles are again united into larger ones by bands of ligamentary tissue. Thus we have our largest muscles developed from a combination of individual fibres, which become bound together by another set of fibres, which running transversely bind them together, giving them strength and power. As these muscles become developed, we find the nerves and the vessels beautifully interwoven in the mass so as to perfect their subsequent action.

The conversion of the fibrin of blood into flesh does not involve any change of composition, as shown by the analyses of these substances by Dr. Playfair.

	Fibrin of Dry Ox Blood.	Dry Ox Flesh.
Carbon	54·35	54·12
Hydrogen	7·50	7·89
Nitrogen	15·76	15·67
Oxygen	22·39	22·32
	100·00	100·00

The red colour which the muscles possess arises from blood circulating in their capillary system, for the fibrin is entirely free from colour.

The skeleton is that bony part of the body which gives it rigidity and to which the form of the animal is mainly due. It is a framework which has to be clothed with muscles, blood-vessels, nerves, and sinews; these would collapse and be inoperative without its support. An examination of the structure and composition of bones will aid us in forming our opinions of their origin. We find them possess one character in common, viz. that they consist of salts of lime enclosed in animal tissue or gelatine. In the centre of the bone is the medullary canal, and around it a series of circular rings of bony matter enclosed in gelatine. These rings do not form an impenetrable mass, for we find a complete system of canals ramifying through them which contain fatty matter, and whilst being a powerful guard against decay, is also a soft medium of communication with numberless little cells named bone cells. These bone cells contain varying proportions of inorganic matter; for where the bones require more strength, there we find the matter more dense in its nature. In the young animal these cells contain a much smaller amount of bone-earth than in the older animals, and for this reason we find the bones of the former can be bent from their natural form, and this form may be rendered permanent by the bone-earth being deposited in the newly arranged cells. As the animal becomes older the shape cannot be changed, for the bone will rather *break* than bend. This is entirely due to the bone-earth present being in much larger proportion than the tissue surrounding it. The materials for the construction of bones are contained in blood, as an examination of the analyses of blood and bone will show.

Analyses of the Inorganic Matter (by ENDERLIN) *in the Blood of*

	An Ox.	A Calf.
Phosphate of soda	16·77	30·18
Common salt and	59·34	52·65
Chloride of potassium	6·12	
Sulphate of soda	3·85	2·94
Phosphate of lime and magnesia ..	4·19	3·49
Oxide and phosphate of iron	8·28	9·28
Gypsum and loss	1·45	1·46
	100·00	100·00

Analysis of the Bones of an Ox, by BERZELIUS.

Gelatine	33·30
Phosphate of lime	55·45
Carbonate of lime	3·85
Fluoride of calcium	2·90
Phosphate of magnesia	2·05
Soda and common salt	2·45
	100·00

The gelatine tissues are formed from the blood, and in these tissues lime salts are deposited as the animal becomes more fully developed, until in the mature animal we find strength and rigidity perfected. We have had occasion to notice the economy of nature in giving strength to the several parts of the body proportioned to the demand which their functions impose upon them, and the structure of bones affords us another instance of the wise provision which pervades every department of animal life, for we find strength and density given most abundantly to those portions of the skeleton, as well as of each individual bone, which have most need of the same. The architect of the animal body never shows a waste of materials or a deficiency of skill in so arranging these materials as to produce the greatest result. It has, however, to be observed, before leaving this subject, that even after the bone is fully formed it may be partly taken up again by the system to supply some more powerful demand which the food cannot supply from its not containing proper matter for this purpose, but this necessarily causes great weakness of the system.

Fat is a highly carbonized compound which exists in the blood. It is chiefly developed in plants and is received into the system through the food, but it can also be produced in the process of digestion from other materials, such as starch and sugar. Analysis has shown that fatty compounds are very generally diffused amongst vegetable produce, but they are especially secreted in the seed. In fact, almost all nutritive vegetable matter has fat intermixed with it. In some seeds these fatty compounds exist more abundantly than in others, and by a microscopic examination of those seeds which yield oil on pressure—such as the linseed—we can detect little drops of oily matter lying close together amongst the cells of the seed. There can be little doubt but that these fatty compounds are produced from the starch of the plant, for chemical examination has shown that as the oil increases the starch decreases. Thus far plants may be looked upon as the purveyors of fat for the use of animals, but if an animal should not obtain a supply of fat ready prepared, there is every reason to believe that it would be able—to do for itself that which under other circumstances would be done by the plant, viz.—to produce fat from the starch of its food. This is a subject which has been contested with much warmth, but I think we shall be safe in considering that, if there are fatty compounds in the food ready prepared for assimilation, the animal will appropriate these in preference to any other matters *which may have to be* converted into fat before they can be rendered available; but should there be any deficiency in the supply of these compounds, then the animal would doubtless convert the starch and sugar of its food into fat.

The use of these fatty compounds is to maintain the heat of the body, and this is done as we have already seen by a union of the carbonaceous matter of the blood with the peroxide of iron of the hæmatosin (or colouring matter of blood), whereby the latter is converted into a carbonate of the protoxide of iron. But this chemical action cannot take place without heat being produced, and as this takes place in the capillary vessels into which the arteries ramify, we see very clearly how heat is so thoroughly diffused throughout the body. The influence resulting from this combustion must be determined by the proportion in which the carbonaceous matter exists in the blood in relation to the oxygen taken in by the lungs. If the supply of carbon or the oxygen should be small, but little heat will be produced. If there is a superfluity of oxygen, then some of it returns in the venous blood and there is less work required to be done by the lungs; but if the supply of oxygen should not be sufficient to consume the carbonaceous compounds present, then the residue unconsumed would be stored away as fat. Whenever the system requires this accumulation of fat in consequence of a deficiency of similar matter in the food, or from the increased quantity of oxygen breathed, then it will again pass into the circulation and be consumed for supporting the heat of the body. There are, however, other important functions performed by the fats of the body, such as the supply of those emollient juices which enable the joints, muscles, and viscera to perform their duties with as little injury as possible.

The secretion of fat therefore depends upon the composition of the blood, but before it can be accumulated in the system there must be proper stores prepared for its reception. These consist of a number of fat cells, which are globular membranaceous bags with glossy surface, and are generally produced in clusters like a bunch of grapes. The cells are formed in the ligamentary tissues, and give that peculiarity of feeling to the flesh of the animal known as "*the touch.*" It is generally believed that although accumulations of fat may be reabsorbed into the system, yet these cells are not so readily destroyed, and that they are not used until the body has yielded nearly all the fat it contained. There is, however, little doubt but that after the fat is used the fat cells will be destroyed should the demand on the system continue.

The chyle contains the fatty compounds of the food, and in the passage of these substances through the lungs and capillary system they not only undergo chemical changes, but by the disturbed equilibrium they occasion they induce changes in other substances. We must not look upon fat as a *definite* compound, for it is composed of several varieties, such as margarine, stearine, elaïne, and others, which exist in varying proportions in different parts of the same animal. These substances offer great opportunities for chemical change, and are found to be oxidised in the lungs and deprived of oxygen in the capillaries. Professor Johnston very well observes:[*] "We are unacquainted as yet with the composition of the several kinds of fat which occur in our ordinary vegetable food; but we know that out of these the cow can form the two kinds of fat, the stearine and elaïne, which exist in its own tallow, and at the same time the two kinds of fat, margarine and butter oil, which are found in its milk. The calf again can change these two latter fats into those which its own body, as well as that of its mother, requires. And lastly, man by eating the fat of the calf can reconvert it into margarine and those other fatty substances which are found in the various parts of his body. Substances which can thus so frequently and so readily be changed the one into the other must be very closely connected, and the mode in which their mutual transformations are effected will no doubt prove to be simple when these transformations are rightly understood." Having, however, undergone the necessary chemical transformations, the fatty compounds are deposited in the fat cells of the animal, and there they remain in a liquid state during the life of the animal, but they quickly assume a crystalline appearance after death. In its fluid condition the fat is constantly ready to enter again into the circulation should circumstances render it necessary, in which case we find it becomes decomposed into carbonic and water, which are composed of the same element.

Besides the substances we have been noticing, viz. the muscles, bones, and fat, which enter so largely into the formation of the animal body, there are many others which perform functions equally important for the maintenance of that equilibrium which constitutes health. The skin, membranes, sinews, nerves, the brain, &c., are severally powerful agents in the animal economy, and a study of their functions will be advantageous and interesting, but I feel I must content myself by introducing to the reader those parts which come more fully under his control in practice. I may, however, observe that, provided the animal is supplied with food suitable for the formation of muscle, bone, and fat, it will at the same time receive all it needs, not only for the growth of those parts to which the feeder is giving especial attention, but every other portion of the body will be fully developed therefrom.

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[*] Johnston's 'Lectures on Agricultural Chemistry,' p. 1024.

BREEDING.

Before leaving this part of my subject I must make a brief reference to *the principles* involved in breeding. It is an old and true axiom for the breeder that *like produces like.* It is altogether impossible for us ever to understand the modus operandi, but the truth of the principle is beyond doubt. In the vegetable world we sow oats or wheat, and these decay, and having become resolved into *their original elements* enter into other combinations forming root, straw, and finally—it may be many months after the original seed has perished—it produces the perfect corn, similar in form, character, and habits to the original seed which perished long prior to its birth. This shows the perfection of those processes of nature which permit of so many changes all preparatory to the final development required. It is the same in the animal life: here we have form, quality, character, and disposition, &c., perpetuated from generation to generation, and knowing as we do from practice that "like begets like," let our practice be influenced thereby.

I have thus endeavoured to bring before the reader a general idea of some of the most important functions of animal life, as shown amongst cattle, and I now propose to proceed to *the practical application of these principles*, so that we may promote and facilitate the operations of nature for the attainment of the results which the agriculturist has in view. In considering this as concisely as possible I shall now endeavour to show the application of the principles of physiology and chemistry to the Management of *Calves*, of *Growing Cattle*, of *Cattle whilst Fattening*, of *Cows during Breeding*, of *Cows in Milk*, and to the *Breeding of Cattle.*

The Management of Calves.—Nature has provided for the newly born calf its proper food in the form of milk. Let us examine this food, and no doubt we shall see that this food is well suited for the requirements of the calf, and some hints may be derived therefrom which will influence our future proceedings. An analysis of cows' milk by Haidlen * shows its composition to be as follows:—

Water	87·24
Butter	3·00
Milk and sugar	4·40
Casein	4·80
Phosphate of lime	·35
" magnesia	
" iron	
Chloride of potassium and sodium	·17
Soda combined with casein	·04
	100·00

Here then we see the ingredients which compose the food which nature has provided for the development of the young animal, and amongst its component ingredients we find substances which are destined to perform various offices in the support of life. *Butter* and *milk sugar* are highly carbonised compounds, and are required for the support of warmth in the body, and for yielding to it the oily matters it requires, whilst *the casein* being a nitrogenised body yields matter for the formation of flesh. There are other ingredients in the milk, and these are required for the growth of the skeleton; and a reference to the analysis of bones already given (page 202) will show that the materials composing the bones are to found in the milk, and also the soda, so necessary for giving the bile its healthy character. Truly we may say, *here is a perfect food*, well adapted for performing all the functions required of food, and capable of yielding to the body all it requires both for its health and growth. Its complete character leads me to believe it to be decidedly preferable to any other food for the young animal, for in no other form can we furnish the nourishment required in a state equally suited to its requirements, or in which it can be more easily assimilated by the calf. If we seek a substitute for milk, this must be our model, and the more closely the artificial food approaches it in character the better will it be. To promote the operations of nature we must watch her proceedings with care and attention.

In the use of milk as food two modes are adopted, the one by allowing the calf to suck the cow, and the other by the calf drinking the milk from a vessel into which it has been previously milked. The food is the same; surely there can be no difference according as it is drank or sucked; but careful observation will prove that the process of sucking is far preferable. The stomach of the calf possesses the same character as ruminants generally, by having four compartments, but in the calf, which is not intended by nature to ruminate so early in life, these stomachs are not brought into use. If, however, the calf *drinks freely* it swallows the milk much faster than it can be received into the digesting stomach, and thus milk becomes deposited in the rumen. The consequence is an entire derangement of the natural process of digestion, under which the calf cannot thrive, and in *many* cases it ends in death. Some persons make the calves suck it from the pail by keeping the hand in the milk, but although this is better than drinking, yet it is open to the same objection in a less degree. The more general practice is to get the calves to drink as soon as possible without the aid of the hand. *There is no plan so well calculated to promote the health and development of a calf as allowing it to suck the cow.*

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* 'Annalen der Chemie und Pharmacie,' lxv. p. 263.

The food which a young calf receives should be in a *liquid* form, for no sooner does the animal consume solid food than its ruminating powers are required, and thus the stomachs which are not intended for early use are brought prematurely into action. If it were wished to give a young calf artificial food to promote its growth, it cannot be better done than *through the medium of the cow.* Whenever the calf first receives solid food its use should be gradual and of good quality. Many of our best breeders do not give anything but liquid food for six or ten weeks, and there is quite sufficient to account for the success which attends the practice. It is by no means an uncommon practice for the supply of new milk to be discontinued when the calf is two or three weeks old, and after that time it is freely supplied with skimmed or scalded milk. The consequence is we have a rank *coarse-boned* animal produced —a class of stock notorious for being unprofitable for the production of fat. This no doubt arises from the milk having been deprived of its fat-producing matter, whilst there is a quantity of bone earth taken into the system more than is proportionate with the general growth of the animal. If the milk *must* be scalded or skimmed I do not think any better substitute can be found than linseed broth or linseed-cake.

Another prejudicial result arises from depriving the calf of the new milk, for the animal cannot maintain its full degree of heat when the food is thus almost entirely deprived of its heat-giving materials. Unless the heat of the body is maintained the animal's growth must be retarded—indeed so connected is the temperature of the body with its growth that we find them increase and decrease in the same proportion. If in addition to this loss of heat-producing food the animal is but poorly defended from the inclemency of the weather, then indeed the growth is checked and in many cases reversed into an actual decrease. The elements of which the body is built up are prone to change. So long as the functions of life are properly performed and healthy action pervades the system, so long will the body withstand the tendency to decay which is written indelibly upon animal matter; but when these functions are languidly and inefficiently performed, then the waste of the body becomes greater than the increase.

Exercise is a most important condition of muscular growth, and in the case of the calf requires special consideration. Motion is produced by the use of the muscles, and always causes a waste of their matter. The simplest motion of the body calls into action some one or more of the muscles, and the result is that a portion of the muscle is thereby removed. This, however, is quickly replaced, and not simply to the same degree, but in more liberal proportions; hence those parts of the body most used, although they sustain the greatest waste, yet they are increased in bulk, because the loss is repaid with interest. To illustrate this by an example, compare the arm of a man who never does any labour with the arm of a smith accustomed to wield the heavy sledge hammer, and we shall find that the arm most actively used is most fully developed. It is exactly the same with young stock: if they have the opportunity of taking free and proper exercise, the various parts of the body will be called into action, and will grow more perfectly than they otherwise would. Indeed nature herself appears to excite the young animal to activity, as shown by its natural desire for frolic and play.

These are the conditions most favourable for the growth and development of calves, and they are those which nature has herself marked out for us. If we follow them we shall attain the best results, but if we disregard them the consequences cannot be satisfactory. Circumstances will doubtless arise to lead to some modifications being adopted, but I believe as we depart from this line in the same degree we sacrifice very important advantages, even if we look *to the ultimate weight of beef* produced; but if we aim at producing *a perfectly developed animal*, it is more especially the case.

The Management of the Growing Animal.—The period of weaning is one which requires care, for as the supplies of milk will now cease, the animal will have to depend upon other food for its support. This should be as complete as its predecessor, and contain nitrogenized, non-nitrogenized, and inorganic matter available for the animal. It should be our endeavour to maintain a steady but *constant* growth, for whenever an animal comes to a check from any cause there must be a loss, and it costs more to bring it again into a progressive state than it would have done to have kept it going on. Our animals should daily become more valuable, for it will never pay to keep them stationary. These checks are to be condemned most strongly upon economical grounds, as well as by all we know of the principles of animal life. The food will vary according to the produce of the farm and other local circumstances, but still, whatever food is employed, it should be so used that the animal shall grow and prosper upon it. Exercise is here as important as in the case of the calf, and hence we should give the growing animal freedom of action in the field or yard. A change of food is highly desirable for animals of this class, and anything approaching a surfeit should be most carefully avoided.

I am well aware that in general practice the young stock of the farm have to combat with many difficulties, and obtain their living in many cases with great labour, but I have yet to see superior results being gained by this course to that which would follow a more liberal system of feeding. The use of linseed-cake is very valuable for animals of this class if only to the extent of one or two pounds daily. It gives a disposition for fattening which is most desirable. In fact, as the animal grows, fat-cells are formed throughout the body, and even if not immediately occupied, yet they become developed and are rapidly filled when the time arrives for thus completing the process of growth. The animal thus fed has a very different touch from another, equal in other respects, which has not had these supplies, and the final fattening of the one will be accomplished much more economically than the other. We have an example of this in our everyday practice, for we all know that it is the last food of a fattening animal which pays the best, and I believe it is entirely due to the fact that for a long time the animal is occupied in preparing the fat cells, and after these are formed the process of filling is rapid.

The Management of Cattle whilst Fattening.—The labour of the agriculturist is directed in many parts of his practice to produce and perpetuate certain *abnormal* conditions. A special modification of a natural product being found desirable and useful, he endeavours to reproduce this deformity. Thus our cultivated crops are totally different from the original stock from which they are descended, and it is the same with cattle. If we seek perfection we shall find it in nature, and the wild animals of each class will be found the most perfect. We domesticate these animals, and thereby modify their conditions of life; and at the same time we observe their peculiarities and perpetuate those *which are desirable.* Hence, although we cannot run contrary to the course of nature, yet, like the mariners who have adverse winds to deal with, we must "tack about" so as to be carried forward by the aid of nature to the attainment of a totally different result from that which the same agencies would have produced had the animal existed in a wild condition. Wild animals enjoying *healthy* constitutions seldom have accumulations of fat about their bodies, and we have every reason to look upon it rather as the product of disease than anything else. Hence we require the conditions of life to be materially altered to accomplish *the peculiar result* we need.

Fat is produced from the carbonaceous matter in the blood, and its chief use in the animal economy is to maintain the heat of the body. There are two organs which separate these matters from the blood, and the more fully they act the more completely will they clear the blood of fat-producing matter, and therefore the less will remain there for being stored away as fat. It is manifest that those circumstances which promote or facilitate these organs in the discharge of their functions must be prejudicial to the formation of fat. The first duty of carbonaceous matter is to maintain the heat of the body, and the more urgent the demand for warmth may be upon the system the more vigorous will be the action of the lungs in its supply. We have already observed that the temperature of the body being many degrees higher than the air, the latter draws from the former a large amount of heat, which has to be supplied from the food by the agency of the lungs. These demands on the food are proportioned to the loss of heat which the animal sustains, and this loss of heat depends upon the difference between the temperature of the body and the air; hence warmth is equivalent to a certain amount of heat-producing matter, or fat. On economical grounds it is better to give warmth and shelter *by comfortable buildings* rather than by food.

This, however, must not be carried out to the prejudice of the ventilation of the building. An animal requires fresh supplies of pure air, and in a state of health a bullock breathes from 700 to 800 times each hour. The breath when it leaves the body contains a quantity of decaying matter, and if it is allowed to pollute the air in the building the animal soon has to breathe over again the air which it had previously used. When the animals thus breathe decaying matter into the lungs it effects a lodgment there, it communicates decay to the lungs, and disease immediately follows. Youatt* remarks on this subject—

"There is one striking fact, showing the injurious effect of heated and impoisoned air on the pulmonary system. There are some cow-houses in which the heat is intense, and the inmates are often in a state of profuse perspiration. The doors and windows must sometimes be opened, and then the wind blows in cold enough upon those close to them, and one would naturally think could not fail to be injurious. No such thing. These are the animals which escape, but the others at the further end, where no wind blows and where no perspiration is checked, are the first to have hoose, inflammation, and consumption. This fact speaks volumes with regard to management in many a farm."

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* 'Cattle,' by Youatt, p. 414.

Here we see most plainly that ventilation is very necessary, and that in economising food by maintaining an equable temperature, we must not overlook the great importance of ventilation.

The *motion* of the animal promotes the action of the lungs, and thereby more heat is circulated through the system. After violent exercise the heat is considerably increased, and much is lost by the perspiration. This also requires larger supplies of oily matter for the body to lubricate those parts which are exposed to friction. These portions of the food might otherwise have been secreted as fat, and from this we may safely assume that *to promote the fattening of an animal it should be restricted from active motion. The quantity of water* which the food contains is another important consideration, for its temperature has to be raised by the heat-producing matter in the food. Hence we should avoid the too liberal use of water for a fattening bullock, either in its food or as drink, but at the same time we must remember that the stomachs of cattle require the food in a *soft pulpy state*, and not commit *a greater error* in keeping them deficient of the proper supply. The character of the excrement will indicate how far the food may be more or less watery.

The size of the lungs influences the production of fat, for the lungs must oxidize the blood in proportion to the number of air cells they contain, and the number of these cells is dependent upon the size of the organ. A largely developed lung will therefore consume considerably more of the fuel of the food than a smaller one, and hence we find that those animals which fatten most readily have the smallest lungs.* The same principle holds good with the *liver*, for, like the lungs, this organ deprives the blood of its carbonaceous matter in the form of bile, and hence there is less left to form fat. It is now generally received as the result of long observation, that a small liver promotes fattening. This view is confirmed by the fact, that during the first ten or twelve weeks sheep are suffering from the rot in the liver they fatten much faster than before. This arises from a *decreased action*, but it must not be carried too far, for when the liver has become so far rotten as not to keep up the general health, then the animal gradually pines away.

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* See Prof. Brown's Report, above, p. 28.—ED.

To illustrate the general principles already enumerated I will refer the reader to Dr. Playfair's remarks respecting the Italian mode of feeding the ortolan. He says [*] —

> "Perhaps the greatest refinement in fattening is exhibited in the manner of feeding ortolans. The ortolan is a small bird esteemed a great delicacy by the Italians. It is the fat of this bird which is so delicious, but it has a peculiar habit of feeding which is opposed to its rapid fattening—that is, that it feeds only at the rising of the sun; yet this peculiarity has not proved an insurmountable obstacle to the Italian gourmands. The ortolans are placed in a warm chamber perfectly dark, with only one aperture in the wall; at a certain hour in the morning the keeper of the birds places a lantern in the orifice of the wall; the dim light thrown by the lantern on the floor of the apartment induces the ortolans to believe that the sun is about to rise, and they greedily consume the food upon the floor; more food is now scattered over it and the lantern is withdrawn. The ortolans, rather surprised at the shortness of the day, think it their duty to fall asleep as the night has spread his sable mantle around them. During sleep little of the food being expended in the production of force, most of it goes to the formation of muscle and fat. After they have been allowed to repose for one or two hours in order to complete the digestion of the food taken, their keeper again exhibits the lantern through the aperture. The rising sun a second time illuminates the apartment; the birds awakening from their slumber apply themselves voraciously to the food on the floor, after having discussed which they are again enveloped in darkness. Thus the sun is made to shed its rising rays into the chamber four or five times every day, and as many nights follow its transitory beams. The ortolans thus treated become like little balls of fat in a few days. The process speaks much for the ingenuity of its inventor, if it does not for the intellect of the ortolans. In this refined mode of feeding every condition for the fattening of an animal is united, *i.e.* warmth, plenty of food, want of exercise."

There is scarcely any practice accepted as calculated to promote the fattening of cattle but is capable of being injudiciously carried out, and this must make us cautious not to trespass far beyond a system which experience has tested. With a knowledge of *the principles* which should regulate our practice we can modify our proceedings so as to realize the objects we have in view without the disadvantages which must follow from a want of judgment and caution.

Management of Cows whilst Breeding.—Here we can resume the consideration of our growing cattle, and the reader will remember that I have advocated a system to be adopted which will maintain a steady but *progressive* development of the body. When this system is adopted, although our heifers will be highly developed, and possess to perfection the unnatural disposition for fattening which we so highly prize, yet we shall find, as the period of breeding approaches, that we have a difficulty to encounter. The system we have been adopting is eminently adapted to promote this character of body, but at the same time it does not favour their *reproductive* powers, and hence a somewhat peculiar course of management has to be adopted when they are wanted to breed. This consists in giving them more exercise, and food of less feeding value; or, in other words, I should give them a run upon poor, and, if possible, hilly grass land. This produces a check to the system which naturally excites the reproductive powers to healthy action. We know in the case of vegetation, that when a plant receives a check it immediately endeavours to perpetuate its species, and so it is in a modified degree with cattle. We have very fully developed a peculiar but unnatural conformation, and hence nature places obstacles in our way, to check our reproducing these deformities; and hence we have a difficulty in breeding from "high-bred" cattle, which is never known amongst wild animals *in a state of nature.*

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[*] Journal of the Royal Agricultural Society, vol. iv. p. 244.

When the heifer or cow is *in-calf* we must discontinue the system of poor dieting, and she must now be treated as if she were a growing animal, for although she may have herself ceased to grow, yet she has within her a fœtus which requires development. Should she be in milk, we must remember that it contains the same materials which are required for the growth of the fœtus, and hence we should be cautious not to let the milking be continued near her calving. During the early stages of the growth of the fœtus it does not draw largely upon the system. After it is six months old its growth and development become rapid, and it is not desirable after this time to draw nourishment from the cow if you desire a well-matured calf. Cows are not generally allowed "to go dry" for so long a time as this, but it will be found real economy to do so if you are dealing with a good animal. Not only does this tend to the improvement of the calf, but it is also calculated to increase the subsequent yield of milk. All sudden and violent exercise must be studiously avoided, as, apart from the derangement of the circulation which results therefrom, the position of the fœtus is often rendered unnatural, and consequently we have false and difficult presentations at the time of calving, whereby both the calf and the cow become injured.

Management of Cows in Milk.—We have had occasion to notice the composition of milk (p. 206), and the reader will be able to judge how far these materials are supplied in the food which the cow receives. Our course of management entirely depends upon the object we have in view. We may dispose of our produce in the form of milk, or as butter and cream, or as cheese, and our yield must necessarily depend upon the proportion in which these several matters exist in the milk. If our produce is to be sold as *new milk*, quantity is the great object we must aim at; succulent food is here to be preferred rather than richer and more solid food. Grains are largely used in our town dairies with this view, for these contain but a small proportion of fatty matter, rather more nutritive matter, but are chiefly a vehicle for presenting to the milk glands a large quantity of blood from which they may separate a considerable *quantity* of poor milk. Mangold-wurtzel, cabbage, turnips, &c., are somewhat of the same character. These act in the same way by virtue of the 90 per cent. of water they contain, yielding a quantity of milk rather than of a rich quality. It is, in point of fact, adopting a system by which the cow adds water to the milk, instead of leaving all to be afterwards added from the never-failing friend of many a town dairyman.

The production of *cream and butter* requires a totally different system, for whilst in the former instance the quantity depended upon the introduction of as much water as possible, in this instance it is controlled entirely by the quantity of oily matter present in it. The various processes adopted for the separation of cream, and the manufacture of butter, are all adopted for the purpose of removing this oily matter as completely as possible. The success of a complete removal depends upon the process adopted, with which we have here nothing to do, but the proportion of oily matter present in the milk depends upon food and management. This oily matter is used for other purposes in the animal body, for it is really a fat, and it is used for supporting respiration and in preventing friction in the body. If, therefore, a large portion is thus used, there must be less remaining to go into the milk. Our endeavour must therefore be to avoid those conditions which cause this waste in the body. We are now dealing with the production of fat *in another form*, and hence the cases are to a great extent parallel. Motion and want of heat use up that which would otherwise form cream. It is for this reason that *cows required for producing cream or butter should be kept as quiet and warm as their health will allow.* The food they receive is the next consideration, and presuming that the foregoing conditions are carefully observed, we may by a good selection of food increase or decrease the produce of cream or butter at will. Fat and the oily matter of milk being so nearly indentical in composition and character, we may naturally anticipate that food adapted for fattening an animal would also produce cream, and such is the case. Oats and linseed-cake are very valuable as food for this purpose.

It may, however, be very naturally inquired,—If the conditions for the production of fat and butter so nearly agree, how is it that our "*highest bred*" animals, which possess a conformation admirably adapted for the production of fat, are generally such poor milkers? It is true they do possess all the conditions necessary for the production and preservation of fatty matter, viz. a small liver, small lungs, quiet and contented disposition, and are capable of converting their food *most perfectly* into oil or fat; but, when so formed and circulating in the system, it has to be appropriated. Those parts of the system most perfectly developed will be furnished with the most active absorbents, and hence the relative strength of the breeding organism and the fat-accumulating tendency of the animal will decide in what manner and in what proportions this oily matter shall be secured. In our highest bred cattle the tendency to produce fat is *strong* and the reproductive organs are *weak*, and consequently the milk-glands are inactive; but in an inferior animal the breeding powers are stronger than its fatting character. Hence, although *the high-bred animal would most perfectly convert its food into oily matter, yet it would have a greater tendency to secrete it as fat than as butter, whilst in a common-bred cow the reverse would be the case.* Here we also see the reason for many good milch-cows fattening so quickly after they are dry, in consequence of the food being, in the first place, well prepared for yielding its fatty matter, and when the milk is stopped it is given entirely to the formation of fat.

We have now to consider what modifications of practice are desirable when our object is *the production of cheese.* Motion, which was condemned in the preceding instances as destroying the materials required, has now a different influence. Every movement of the body produces a waste of its tissues, and hence active exercise removes from the body tissues and cellular membranes, which pass away into the blood, and are then taken up by the milk absorbents, and reappear in the milk as casein or cheese. The milk of a cow recently calved has been examined by Henry and Chevallier, and has been found to contain 15 per cent. of casein—more than three times the ordinary proportion, and arising entirely from the destruction of its organism during the violent action of parturition. It is clear that if, in the management of a cow, we can favour its motion, we shall produce more cheesy matter. The practice of different districts shows how experience has taught that which science explains. In our cheese districts the cows invariably graze in the fields, and the cows fed upon the poorest land are noted for producing the largest quantity of cheese, because they have to walk about so much for gathering their food; but it does not possess the richness which characterises the cheese from better pasturage, for there the cow soon gathers all she wants, and is quietly and peacefully converting it into nourishment, whilst the other on the poor land is working hard to find her food. The richness of cheese is due to the oily matter which the fattening character of the herbage has introduced into the system, and is not afterwards expired from the lungs in consequence of active exercise or cold.

If we look into the town dairies, where quantity of milk is required, there we find a mixed assembly of badly bred cows; these answer the purpose for which they are kept, viz. producing abundance of milk. On our butter farms we find cows of better breed, and generally our *best* dairies show the cows as high bred as it is possible to have them *without injury to their breeding character*,—here showing an economy in the conversion of food and an energy of system to appropriate it as *butter* after. In the production of cheese we have a considerable influence over the yield by the food given. Pea and bean meal and clover are amongst our most valuable feeding articles, and their use is advisable upon cheese-farms where the land is rich.

The Breeding of Cattle.—In the reproduction of our domesticated breeds of cattle our object is to perpetuate certain conditions which are rather contradictory to each other, and, therefore, having placed them in an artificial condition, we have to adopt an artificial process to accomplish the peculiar results we have in view. If we were dealing with animals in a state of nature, we need be under no apprehension of their perpetuating their species and keeping themselves up to the standard of the original stock. The bulls which possessed most strength and courage would be the sires of the young stock; and, as any became enfeebled by age or debilitated by disease, they would have to yield to more perfect and better constitutioned animals. Thus we have in this natural process a guarantee for the male animals possessing strong and vigorous constitutions. Our domesticated bull is a totally different animal, and that which for economical purposes we consider a very perfect development is in reality an unnatural deformity. This we want to perpetuate, and we have to combat with the natural hindrances which impede our doing so. But, availing ourselves of the law that "like produces like," we select animals possessing the qualifications required; and in perpetuating from these we endeavour to surmount the obstacles before referred to.

There is a very close relationship between the external form of an animal and its internal development, and we are enabled to decide whether or not an animal possesses a disposition for fattening by its general "contour." Peculiarity of form is hereditary, as well as the habit and disposition incidentally connected therewith. I shall, therefore, state that peculiarity of development which is most highly valued, as indicating strength of constitution combined with a disposition for fattening:—

The head should be rather small in proportion to the animal, and well set on the neck; with a fine tapering muzzle; a broad forehead; bright, full, yet placid eye; furnished with graceful, well-turned horns, of fine quality; and ears small and fine.

The neck should be thick, not too short, but having a graceful appearance, by tapering steadily towards the head, and yet not getting thin behind the ears.

The shoulder should lie snugly in the carcase; it should be covered with a well-developed muscle down to the knee, below which it should possess a fine and flat bony support.

The chest should be bold and prominent, wide and deep, furnished with a deep but not a coarse dewlap.

The carcase should be barrel-shaped, having a level and broad top, especially across the hips; the ribs should be well rounded; the space between the last rib and hips should not be too short, yet at the same time we must guard against too great length, although there will be little ground for objection provided the rib is well rounded and the loin flat, and this will add weight to the animal in a good part. The flank should be full and pendant.

The hind-legs should be full and fleshy down to the hock, with a well-developed buttock, showing great substance; but below the hock we require a fine and clearly-formed bone.

The tail should be finely formed, without much hair.

The hide mellow to the touch, covered with a fine yet plentiful coat of hair.

Animals thus developed in all their points will be alike gratifying to the eye of the connoisseur and profitable to the grazier. Here we have well-developed muscles with a disposition for fattening, and the offal of the body reduced to a minimum point. These are the animals we wish to perpetuate, but they are not of every-day occurrence. I have said, when referring to the North Devon stock, that animals possessing these qualifications may convey to their produce a similar disposition and tendency; but, if the opportunity is not offered for *the exercise of the tendency* by proper food and management, we may produce a thoroughly ill-conditioned animal from the most perfect of parents.

In the breeding of cattle the farmer should, in the first place, decide upon the object he has in view, and it may be either of the three following:—

The production of stock valuable for breeding.

The production of a certain weight of beef.

The production of cows for dairy purposes.

The production of stock valuable *for breeding purposes* will be most advantageously done by selecting the purest and most perfect of the breed. Under such circumstances *the best are not too good*, and I believe they are generally the cheapest in the end. Let the stock be selected as perfect as possible, and let the subsequent management pursued be calculated to render the produce fully developed. This is the right principle to act upon, and thus the standard character of the breed will rise to a higher level, and the entire offspring will realise high prices for breeding purposes. It is no use dealing with *second-class* animals for such purposes, for the breeder will only disappoint his expectations. He must have stock of *first* quality with good pedigrees if possible, and keep them well, or he cannot be successful; but with these conditions observed he will benefit himself and do good to the agricultural community in general.

But what is the value of pedigree? I can imagine some one to inquire. It depends entirely upon a fuller development of the principle of "like producing like," by which cattle produce stock possessing the character of their predecessors, whether bad or good. It is also desirable to know the pedigree of the animal, in order that we may avoid "breeding in and in" too closely. This is very objectionable, being calculated to give a weak constitution and an imperfect body with a decrease of size. Comet, one of the best Short-horn bulls ever bred, and which was sold at Mr. C. Collings' sale, October 11th, 1810, for 1000 guineas, was produced under the severest trial of "in and in breeding." There have been some animals thus produced almost perfect, *but they are exceptional cases.* Many a calf with a high pedigree has been quietly put aside rather than any one should know of its deformed growth. Instances are upon record of entire herds suffering great losses of stock, and becoming comparatively unproductive, from close relationship; and yet, when a decided cross has been made in the breed, they have entirely got over it.

Breeding Stock for the production of Beef is another and perfectly distinct object from the foregoing. It is not the pure-bred animal which is best suited for this purpose, because, if descended from parents which ought to be kept for breeding for stock, such produce ought never to be valued at beef price. The object here aimed at will be best attained by the use of a bull as well bred as possible with a cow of large frame, kindly habit of body, possessing good milking character, without any pedigree descent at all. The class known as "the really useful cow" is the one best suited for this purpose, because by the use of a good bull you will have *form* and *quality* given to the calf, and in such a cow there will be *room for its growth* before it is calved, and, being a good milker, *she will nourish her calf*, both before and after birth, better than a higher bred cow. Thus the calf will attain more size and make a heavier animal, combined with quality and aptitude for fattening. It will also be more hardy in constitution, and less liable to disease. It must, however, be marked as an animal for beef; for, however good it may be in form, the produce of such an animal would be considerably inferior. It is the *first cross* which gives you the advantages of both parents, whilst the second gives you many bad qualities. *The object* must be studiously followed out, and by no means must they be looked upon as identical. This is the system for more general adoption, whilst the rearing of the best stock for the supply of bulls should be in the hands of a few, and these should be *extensive* breeders.

The Breeding of Stock for Dairy purposes admits of and requires the same selection being made as is desirable in other cases. The breed most general in a district is the breed which will be kept there; and, although some instances will arise of cows of a different breed being brought from a distance, yet such cases will be exceptional. Much, however, may be done for the improvement of the cattle of any locality by carefully saving the heifer calves from *the best milkers,* and if these are afterwards crossed with bulls also bred from good milkers the progeny will show marked improvement for dairy purposes. In some cases the use of an Alderney or Guernsey bull has been found to increase the aptitude for milking; but much may be done by a judicious selection of stock from good milkers. The difference in value between cows is rarely appreciated to its full extent: for instance, how frequently we find two cows under the same circumstances, and each maintained at the same expense; the one, perhaps, giving 2 gallons, whilst the other yields 4 gallons, and even more, of equally good milk—a difference which, in the course of *one* season, would be nearly equal to the value of the inferior one. Still, quantity alone must not decide the value of a milker. An experiment (reported by Johnston*) tried at Bradley Hall, Derbyshire, between different breeds under similar circumstances, gave the following results:—

	Milk	produced Butter.	1 lb. of Butter was yielded by
	Quarts.	Ounces.	Quarts.
Holderness Cow	29	38½	12
Alderney Cow	19	25	12
Devon Cow	17	28	9¾
Ayrshire Cow	20	34	9½

The age at which young stock commence breeding influences them through life. My observation has led me to believe that when an animal proves in-calf at an early age—say 15 months old—she will be a better milker than if allowed to remain out of calf until 2 years old, for the energies of nature are thus misdirected from the development of the parent to the support of the offspring, and hence the cow becomes ill-shaped, but rather a better milker.

These are the general rules which regulate us in perpetuating the good characters we desire; but there are also bad qualities, and these are equally hereditary. ·A jealous care must be exercised to prevent our breeding from cattle calculated to communicate hereditary diseases. Diarrhœa, dysentery, and consumption are of this class, and their indications are well-defined in most cases. The carcase of such an animal is thin and long; the neck thin, especially behind the ears; the hips are narrow; the chest small and narrow; the flank sunken; the skin appears unhealthy and scurfy, and the bones of the tail show themselves very prominently on the rump. They are always subject to illness, and exceedingly difficult to rear, requiring constant care as to their food. Cattle predisposed to rheumatic affections and tumours should also be condemned, as they will in all probability produce stock suffering from these hereditary diseases.

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* Johnston's 'Lectures on Agricultural Chemistry,' p. 935.

In conclusion, I may say that constitution, quality, form, temper, and disposition of body for or against disease, may be rendered hereditary, and that, by a due consideration of these points, either good or bad qualities may be perpetuated.

The Lodge, Puddyngton, near
Crediton, Devon.

XI.—*On the use of Lime, Marl, and Shell-sand in Agriculture, with special reference to the Soils in the West of England.* By Dr. AUGUSTUS VOELCKER.

THE use of lime in agriculture dates from a very remote period, and its utility as one of the cheapest and most effective means for raising the fertility of many soils is generally acknowledged by all who take an interest in good farming. At the same time it is conceded, even by the best friends of this useful mineral manure, that the application of lime and marl is often abused, or at any rate that the money periodically spent in liming might be more judiciously applied by diminishing the usual application of lime, and expending the money thus saved in the purchase of artificial manures.

The effects of the first application of lime or marl on newly broken-up land that has been long out of cultivation are truly marvellous, and for a number of years the increased fertility of the land can be maintained undiminished. But it is well known that no soil, however fertile it may be originally, can be maintained in good heart by the use of lime alone. Experience, indeed, has shown that the constant application of lime to the land, on the expense of ordinary manuring, sooner or later will reduce the fertility of the land, at first greatly increased by lime, until it ceases to produce remunerative crops and enters into the condition in which it is said to have been exhausted by lime, or to have been overlimed.

Some soils are much more readily exhausted by repeated applications of lime than others. There are many soils in the West of England which appear to require scarcely anything else but lime in order to make them yield abundant crops. This circumstance perhaps explains the fact that probably in no part of this country lime is so much esteemed and so generally applied to the land as in the West of England. Again, there are soils which are not improved at all by lime, and whole districts in which lime or marl are never used by good farmers. The character of the soil thus materially affects the use of lime in agriculture. Furthermore, it is a well-known fact that the form in which lime is used influences the result which it is expected to produce. And lastly, we would observe that the effects of lime on vegetation are greatly modified according to the use of good or bad lime. The quality of lime, of course, is dependent upon that of the limestone from which the former is made.

Continued attention to the functions which lime exercises in relation to our cultivated crops, and the examination of several limestones, marls, samples of shell-sand, as well as a good many soils occurring in the district over which the operations of the Bath and West of England Society extends, have enabled me to draw up the following Report, which I trust will be generally useful as a guide to those who require information respecting the use of lime in agriculture; and to be of more particular interest to many of the members of the Bath and West of England Agricultural Society.

I propose to speak, in the first place, of the forms in which lime is used in agriculture, and under this head to refer especially to the composition of a good many limestones, marls, and varieties of shell-sand that occur in the West, and are extensively used, chiefly for agricultural and to a minor extent for other purposes. In the next place, it will be my duty briefly to allude to the functions of lime upon the soil and vegetation, for a proper appreciation of the first principles involved in this subject is absolutely necessary in order that the farmer may derive the full advantage which lime is capable of affording. Under the third and last general head I shall have to offer some remarks on the application of lime, marl, and shell-sand to the soils in the West of England, and shall then more specially notice the composition of soils in different localities within the circle of the Society's operations, and shall illustrate by some examples which actually came under my notice some of the general principles that ought to regulate the application of lime to the land.

I. On the forms in which Lime is used in Agriculture.

Lime is used in agriculture generally in one of the following forms:—

1. Burnt and slaked lime.
2. Chalk.
3. Marl.
4. Shell and coral sand.

The characters and composition of these different forms in which lime is applied to the land will be described in the order here given.

Burnt, or quicklime, as every one knows, does not occur as a natural mineral, but is produced on burning limestone in a kiln. The quantities of quicklime depend in a great measure on the composition of the stone from which it is obtained.

1. *On the Composition of several kinds of Limestone found in the West of England, and on Quick and Slaked Lime.*

The bulk of all limestone consists of carbonate of lime, *i. e.* a combination of carbonic acid with lime. Pure white marble consists almost entirely of this combination, and in some of the best descriptions of ordinary limestone the proportion of carbonate of lime amounts, as we shall see presently, to 94 or even 96 per cent. Usually, however, the proportion of carbonate of lime is smaller, since carbonate of magnesia, oxides of iron, some alumina, and more or less silicious matters, and a few other mineral matters that need not be mentioned here in detail, enter into the composition of ordinary limestones.

The colour, degree of hardness, and general appearance of the various kinds of limestones depend in a great measure on the relative proportions in which the constituents just named occur in them. The differences which prevail in the various kinds of limestones, however, are not entirely due to variations in composition, but they can be traced likewise to purely physical causes which have been in operation when the solid limestones were formed. Frequently the composition of different limestones presents us with but slight variations, whilst their texture, degree of hardness, and adaptation for practical purposes exhibit great contrasts. According to the prevailing physical and chemical properties, limestones may be conveniently classed as follows:—

a. Building stones.
b. Hydraulic limestones.
c. Agricultural limestones.

a. Limestones used for building.—Some of our best building-stones occur in the West of England, as, for instance, the celebrated Bath stone and similar oolitic limestones which occur in the neighbourhood of Bath and Bristol. Good building-stones are hard and uniform in texture, and capable of resisting atmospheric influences in a higher degree than ordinary limestones, which, on account of the want of this essential qualification, are not generally used for building purposes. An excellent oolitic building-stone is the Dundry stone, which is quarried near Bristol. A specimen of this stone, analysed by me, yielded the following results:—

Water, driven off at 212° Fahr.	·230
Water of combination	·110
Carbonate of lime	96·146
Sulphate of lime	·153
Magnesia	·470
Protoxide of iron	·540
Alumina	·120
Soda	·044
Potash	·296
Silica	1·350
	99·459

The church of St. Mary Redcliffe, Bristol, is built of this stone; the tower is of the twelfth, the body of the church of the fifteenth century. Mr. Godwin, the restorer of this beautiful church, informs me that he considers the Dundry stone quite as good as Caen stone, which for some time was employed in the restoration of this church, but which is now superseded by the Dundry stone, of which the church was originally built.

As it may not be uninteresting to compare with the preceding analyses that of Caen stone, I may be allowed to mention here an analysis of that stone and also two others of oolitic limestones used for building. One of the latter represents the composition of the oolitic limestone from Downside, Brackley Combe, near Bristol; the other that of the oolitic limestone, Combe Down, Bath. The three subjoined analyses were made by Messrs. Ransome and Cooper:—

Composition of Oolitic Limestone, Caen, Normandy.

Water	1·91
Silica	13·71
Protoxide of iron	·73
Carbonate of lime	82·58
Magnesia	·48
	99·41

This stone is used for internal work in the new Houses of Parliament, also in part of Westminster Abbey and in Canterbury Cathedral. It is very fine-grained and well adapted for delicate carvings.

Composition of Oolitic Limestone from Downside, Brockley Combe, near Bristol.

Water	·47
Silica	4·64
Peroxide of iron	·27
Carbonate of manganese	·55
" " iron	·34
" " lime	92·58
" " magnesia	·25
	99·10

Composition of Oolitic Limestone, Combe Downs, Bath.

Water	·74
Silica	·85
Protoxide of iron	1·04
Alumina	·61
Carbonate of lime	95·74
" " soda	·71
Magnesia	·23
Chloride of sodium	·05
	99·97

This stone was used in the restoration of Henry the Seventh's chapel, Westminster Abbey, but appears readily to decay, and is decidedly inferior to Dundry stone, although it differs but little from the latter in composition.

b. Hydraulic Limestones.—A hydraulic limestone is a stone which, on burning, furnishes lime that sets under water. The physical characters of hydraulic limestones vary exceedingly; their colour generally is dark blue or brown, more rarely yellow, and, generally speaking, they are hard and compact. This description of limestone is always an impure form in which carbonate of lime occurs in nature, and generally, though not always, the most impure limestones produce the best hydraulic lime or cement on burning. The impurities are chiefly magnesia, sand, clay, silicate of lime, and alkaline silicates. Hydraulic limestones are not confined to a particular geological formation, but they abound in the lias formation. Lias lime, therefore, is commonly regarded as a bad agricultural lime, and for this reason seldom used by farmers if another description of lime can be procured at a reasonable price. Some silurian limestones also form good cements after burning.

In order to convey to the reader an idea of the composition of a good hydraulic limestone, I give the analysis of a limestone which occurs in the neighbourhood of Totnes. The specimen which I analysed was forwarded to me by Mr. Watson, of Dorsly, near Totnes, who informs me that it was taken from

Habertonford quarry, situated just at the end of the trap-rock district. When used for building walls it forms a mass as hard as rock, and it sets as a cement when used for forming ponds, for which purpose it is largely employed.

Composition of Hydraulic Limestone from Habertonford Quarry, near Totnes.

	Dried at 212° Fahr.
Water of combination	1·51
Oxides of iron and alumina	1·59
Carbonate of lime	83·86
Sulphate of lime	·10
Magnesia (in the state of silicate)	·63
Insoluble silicious matter (clay and sand)	12·06
Alkalies (in the state of silicates)	·25
	100·00

A much inferior cement, or, properly speaking, a bad lime, is produced on burning a lias-limestone which occurs at Stapleton, near Bristol. A specimen of this stone gave, on analysis, the following results:—

Water of combination, and a little moisture	2·12
Oxides of iron and alumina	2·06
Carbonate of lime	84·64
„ „ magnesia	·69
Insoluble silicious matter (clay and sand)	10·49
	100·00

Other lias limestone from the West of England will be described presently under agricultural limestones.

To give an example of a silurian limestone, which partakes of the characters of a hydraulic lime after burning, the following analysis, to which I submitted a limestone from Pembrokeshire, may be stated:—

Composition of Silurian Limestone from Clynderwen, Pembrokeshire.

Moisture, driven off at 212° Fahr.	·18
Water of combination	·52
Oxides of iron and alumina	·91
Containing phosphoric acid	(·022)
Carbonate of lime	81·70
Sulphate of lime	·10
Carbonate of magnesia	·79
Insoluble silicious matter	15·86
	100·06

It will be seen that all three limestones are very impure, but although the amount of carbonate of lime is larger in the Habertonford lime than in the two others, it produces a better cement, thus showing that it is not merely the presence of certain impurities, but also the state of combination in which they occur, which renders one limestone better adapted for the making of cement than another.

c. Agricultural Limestones.—For agricultural purposes all limestones are applicable which contain above 60 per cent. of lime and are free from impurities, the presence of which in limestones, often much richer in lime, has the effect of yielding a lime, after burning, that sets under water.

The comparative value of different limestones varies exceedingly, since some kinds produce, on burning, products that slake with difficulty, and are, in comparison with others, poor in lime; whilst some when burned in the kiln readily slake and furnish a voluminous minutely-subdivided powder rich in lime. These differences are due to natural variations in the composition of limestones from different geological formations, as well as to variations in the composition of limestones of the different beds of one and the same formation. Generally speaking, the higher the percentage of carbonate of lime, and the smaller the amount of foreign matters, which a limestone naturally contains, the better it is adapted for burning. However, the physical character, no less than the chemical composition, of limestones, has to be regarded in estimating their fitness for burning. The hard, compact, crystalline kinds generally produce a better lime—other circumstances being equal—than softer, more friable, and lighter specimens. There are, indeed, some limestones, rich in carbonate of lime, which, on account of their slight cohesive power and porosity, cannot be economically employed for the making of quicklime. But, on the whole, the composition of limestones affords excellent indications as to their fitness for burning into quicklime. I shall, therefore, consider in detail the composition of several specimens of limestones from various localities in the West of England.

The limestones which I had an opportunity of examining geologically are distinguished as Carboniferous, or mountain limestone; Lias limestone; Silurian limestone; Caradoc sandstone; Oolitic limestone.

Mountain limestone occurs in great perfection in South Wales and in Devonshire. In the last-mentioned county it often forms isolated hills of very limited extent, and as the soils in the neighbourhood are peculiarly destitute of lime, these mountain limestone hills are considered a great boon to the agricultural community.

Mountain limestone also is found in Somersetshire, where it and lias lime are much employed for agricultural purposes.

The colour of mountain limestone is various: some beds are light-grey, others yellow, blue, dark-grey, almost black. The dark-coloured specimens are often very dense, crystalline, hard, and not unlike basalt. Many beds are full of shells, others almost destitute of fossil remains. In short, the aspect and physical characters of mountain limestones, no less than their composition, vary considerably, as will be seen by inspecting the subjoined analyses. In the first place, I shall notice the composition of an excellent light-coloured, compact mountain limestone from South Wales, which in the following tabulated results is grouped together with a limestone from Dartbridge, near Totnes, on account of the similarity in composition which both exhibit.

Composition of Mountain Limestone from South Wales, No. I.; *and Limestone from Dartbridge Quarry, Totnes,* No. II.

	No. I.	No. II.
Water	·286	·49
Oxides of iron and alumina	·390	·93
Carbonate of lime	96·350	95·57
,, ,, magnesia	2·289	·85
Insoluble silicious matter	·858	2·05
	100·173	99·85

In both stones the percentage of carbonate of lime is high; both are compact, crystalline, and give, on burning, good lime. No. 1, especially, is an excellent limestone, for the quicklime produced from it swells up very much on slaking, and hardly contains any silicious impurities.

It is often the case that two quarries, not far removed from each other, yield limestones very different in appearance and in value. By comparing the analysis of the limestones from Dartbridge Quarry, situated in a slate district, with that of Habertonford Quarry, and mentioned under Hydraulic limestones, the reader will at once be struck with the great variations which the stones from these two quarries exhibit. Differences equally great will be observed on comparing the Dartbridge limestone with the following analysis of a limestone from Petehole Quarry, situated in a heavy clay district in the neighbourhood of Totnes:—

Composition of Limestone from Petehole Quarry, near Totnes.

Organic matter (graphite), and a little water of combination	1·98
Oxides of iron and alumina	2·50
Carbonate of lime	71·11
Lime in a state of silicate	1·33
Sulphate of lime	1·14
Magnesia in a state of silicate	·99
Insoluble silicious matter	20·95
	100·00

Mr. Watson, of Dorsley, who kindly forwarded to me these three limestones occurring in the neighbourhood of Totnes, informs me that Dartbridge Quarry is situated 8 miles from Petehole Quarry and 12 miles from Habertonford Quarry, and Petehole Quarry is situated 4 miles from Habertonford Quarry.

Like the Habertonford limestones, that from Petehole Quarry contains a large quantity of insoluble silicious matter and sand. The lime which enters into its composition does not all occur as carbonate, but some of it is in combination with sulphuric acid, as well as with silicic acid. The proportion of sulphate of lime in this limestone is much larger than usual. It also contains organic matter, in the shape of graphite,—a constituent which rarely enters into the composition of limestones. This stone appears to be a limestone changed from its original constitution by subsequent volcanic action and admixture of the products of violent subterranean commotion.

I have not learned whether or not the Petehole limestone makes good lime, but am inclined to think that it will not. At any rate, it is evident that this stone, which contains only 71 per cent. of carbonate of lime, cannot produce a lime as valuable for agricultural purposes as the limestone from Dartbridge Quarry, in which stone no less than 95 per cent. of carbonate of lime occurs.

In the next Table I have arranged the results of two specimens of Lias limestone from Aberthaw, Glamorganshire.

Composition of Lias Limestones from Aberthaw, Glamorganshire.

	1st Specimen.	2nd Specimen.
Moisture	·260	·666
Water of combination	·290	
Oxides of iron and alumina	·483	1·333
Phosphoric acid	·167	
Carbonate of lime	89·870	89·332
Sulphate of lime	·110	not determined.
Carbonate of magnesia	·880	2·336
Insoluble silicious matter	8·120	6·333
	103·180	100·00

Both analyses were made with stones from the same quarry. It will be seen that No. 2 contains more magnesia and less insoluble silicious matter than No. 1, and that both contain about the same quantity of carbonate of lime. The quicklime obtained from it is rich in lime, but, like most Lias limes, it does not swell much on slaking, and is better adapted for cement-making than for quicklime. Still, in the absence of a better lime, it is usefully employed for agricultural purposes. Lias lime, when used for agricultural purposes, I may observe, does not readily slake spontaneously, like good mountain-lime, and often requires to be mixed at once with water in order to become reduced to powder.

Silurian limestones, as well as limestones belonging to the Caradoc sandstone, occur in Glamorganshire and Pembrokeshire. An analysis of a Silurian limestone has been given already; I will now place on record the analysis of a limestone which occurs in Pembrokeshire, and which by geologists would be termed Caradoc sandstone:—

Composition of Caradoc Sandstone, Pembrokeshire.

Water of combination	·13
Oxides of iron and alumina	2·66
Carbonate of lime	81·55
„ „ strontia	3·77
„ „ magnesia	1·04
Sand and some insoluble silicious matter	11·02
	100·17

It is worthy of remark that stones called in common life sandstones, may, like the specimen of Caradoc sandstone, contain a high percentage of carbonate of lime, and be well adapted for burning into quicklime. This is actually the case with the Caradoc sandstone; it produces indeed in burning a valuable lime, since it slakes readily and yields what is technically called a tolerably fat lime.

It will be seen that the analysis shows about 11 per cent. of sand and insoluble silicious matter, which is more than the proportion of insoluble matters in the preceding Lias limestones. Notwithstanding this larger amount of insoluble silicious matter in the Caradoc sandstone, it yields a better lime than the Lias limestone, which circumstance is explained by the fact that the insoluble matter in the latter occurs principally as clay, whilst in the former it exists chiefly as sand.

Apart from the practical interest that attaches to this analysis, it is interesting in a mineralogical point of view, inasmuch as it exhibits a considerable quantity of carbonate of strontia, a constituent which so far as I know has not been noticed before in Caradoc sandstone.

In the preceding analyses the amount of carbonate of lime and that of the ordinary impurities, such as magnesia, oxide of iron, sand and clay, which accompany the former in agricultural limestones, has been determined; but with one exception no notice has been taken of the small proportions of phosphoric and sulphuric acid, which it is well known occur occasionally in limestones.

As phosphoric acid is a valuable fertilising constituent, it appeared to me not unlikely that the agricultural value of different kinds of lime might be influenced by the relative proportions of phosphoric and sulphuric acid which they contain. In order to ascertain if the best agricultural limestones really contain more phosphoric acid than others less valued by the farmer, I procured several kinds of limestones, and submitted them to a refined process of analysis, in which especial care was taken to ascertain accurately the amount of phosphoric acid.

The results of this examination are embodied in the subjoined Table:—

Composition of Carboniferous, or Mountain Limestone, from Williamson, Pembrokeshire (No. I.); *Mountain Limestone from Ashburton, Devonshire* (No. II.); *and Silurian Limestone from Llandewi, Pembrokeshire* (No. III.).

	No. I.	No. II.	No. III.
Moisture	·050	·200	·120
Water of combination	·170		·230
Oxides of iron and alumina	·193	·718	·683
Phosphoric acid	·057	·012	·077
Equal to bone-earth	(·123)	(·026)	(·166)
Sulphate of lime	·080	·100	·050
Magnesia	·400	1·490	·150
Insoluble silicious matter	·170	1·760	13·720
Carbonate of lime	99·080	95·490	84·740
	100·200	99·770	99·810

On comparing these analytical results with each other it will be seen:—

1. That the proportion of phosphoric acid in the less pure Silurian limestone from Llandewi is somewhat greater than in the much purer limestones from Williamson and Ashburton, and that in all three limestones the quantity of phosphoric acid is very small.

2. That the proportion of sulphate of lime or gypsum likewise is very inconsiderable in all three specimens analysed.

3. That No. III. contains nearly 14 per cent. of insoluble silicious matter, whilst No. I. contains a mere trace, and No. II. not quite 2 per cent.

4. That the proportion of pure carbonate of lime is very large in the limestone from Williamson, somewhat smaller in the Ashburton limestone, and considerably smaller in the Llandewi stone.

5. That No. I. altogether contains only 1 per cent. of foreign matters, whilst in No. II. there are 4½ per cent. and in No. III. about 15 per cent. of foreign matters.

6. That the amount of magnesia found in either of these three limestones is inconsiderable.

It follows from these analytical results that the Williamson limestone, notwithstanding the somewat smaller amount of phosphoric acid in comparison with No. III., is by far the best, and has to be considered as one of the most valuable agricultural limestones that can be found anywhere. This limestone indeed contains nearly as much pure carbonate of lime as the Carrara marble, the composition of which is stated by Wittstein, who analysed it, as follows:—

Composition of Carrara Marble.

Carbonate of lime	99·236
,, ,, magnesia	·284
Oxide of iron	·251
Silica	none
	99·771

On burning, the limestone from Williamson yields a splendid white lime, which readily slakes spontaneously on exposure to the air, and falls to a light powder as fine as flour.

The Ashburton limestone, though not quite as good as the limestone from Williamson, is an excellent agricultural limestone. It burns well, and also falls to a fine white and light powder. This Silurian limestone, on the contrary, like the other Silurian limestone the analysis of which has been stated already, and indeed like most Silurian limestones, does not produce a very good lime.

The limestone from Llandewi, I am informed by Mr. Morgan of Haverford-West, who supplied me with most specimens of Welsh limestones, makes a red-coloured lime, which by some farmers, on account of its somewhat cheaper price, is preferred to the beautifully white and extremely light lime from Williamson. I believe, however, that it is bad economy to save a few shillings in the purchase of an inferior lime, if such a splendid lime as the Williamson lime can be easily obtained at a trifling higher price.

Oolitic limestones.—These are very common in Gloucestershire and part of Somersetshire. The best lime of the oolitic limestone series is produced from the Great Oolite or Bath stone.

Limestones belonging to the Inferior Oolite rock are invariably of less value for lime-burning than the Great Oolite rocks. Cornbrash, Forest Marble limestone, and Stonesfield slate, a variety of slaty limestone, I believe are seldom, if ever, used for the making of quicklime.

I shall first notice the composition of Great Oolite and Inferior Oolite limestone, and then give in a separate Table the composition of the other oolitic limestone rocks.

Composition of Great (No. I.) *and Inferior Oolite Limestone* (Nos. II. and III.).

	No. I.		No. II.		No. III.
Carbonate of lime	95·346	..	89·20	..	85·339
Sulphate of lime	·204	..	·09	..	Water. 2·300
Phosphoric acid	·124	..	·06		not determined.
(Equal to bone-earth)	(·260)	..	(·14)		.. ..
Magnesia	·739	..	·34	..	1·028
Oxides of iron and alumina ..	1·422	..	4·14	..	3·833
Soluble silica	1·016	..	2.75	..	7·565
Insoluble silicious matter ..	·533	..	3·27		
	99·384	..	99·85	..	100·065

No. I. is a good limestone, equally useful as a building stone and for burning.

No. II. cannot be used for building, but being hard does well for road mending; less valuable it is to the lime-burner.

Both these stones are from the neighbourhood of Cirencester.

No. III. occurs in the neighbourhood of Combe, near Sherborne, and resembles in its general features the specimen of Inferior Oolite limestone from the neighbourhood of Cirencester.

Composition of Cornbrash (No. I.); *Stonefield Slate* (No. II.); *and Forest Marble Limestone* (No. III.).

	No. I.		No. II.		No. III.
Carbonate of lime	89·195	..	84·264	..	81·242
Sulphate of lime	·241	..	·649	..	·737
Phosphoric acid	·177	..	·177	..	·032
(Equal to bone-earth)	(·364)	..	(·244)	..	(·072)
Magnesia	·771	..	·454	..	·372
Oxide of iron and alumina ..	2·978	..	1·809	..	1·420
Soluble silica	1·231	..	·582	..	1·210
Insoluble silicious matters ..	4·827	..	11·558	..	15·240
	99·420	..	99·433	..	100·210

Cornbrash limestone, it will be seen, contains most lime, and likewise an appreciable quantity of phosphoric acid; but its texture is such that it cannot be conveniently used as a building stone, nor does it do well for lime-burning. The soils resting on Cornbrash, and formed by its degradation and decomposition, are noted for their corn-growing qualities: hence the derivation of the name Cornbrash.

Stonefield slate and Forest Marble limestones are both very impure forms of carbonate of lime. Stonefield slate on account of its slaty structure is used as roofing slate; and some of the beds of forest marble, which separate into thin slates, furnish slabs for barn-floors and pigsties.

On the Value of Limestones for Agricultural purposes.—It has been assumed that a limestone is the more valuable for burning the more lime and the less magnesia it contains. Magnesia is often considered prejudicial to vegetation, and for this reason limestones containing much magnesia are deemed unfit for burning. It is true many magnesian limestones on burning produce poor lime that slakes with difficulty, and does not swell much on slaking, and such lime of course cannot act so beneficially upon vegetation as other varieties, which fall to a fine floury powder and are richer in pure lime. But it does not appear to me logical to infer from the different results which good and bad limes produce upon vegetation that magnesia is injurious to vegetation. Direct experiments which have been made with caustic magnesia indeed have shown that there is no foundation for the alleged injurious effects of caustic magnesia, which is supposed by many practical and scientific men to burn up vegetation. It appears also that this erroneous view respecting the action of magnesia upon plants arises from the purely accidental circumstance that bad limes often contain much magnesia. Space prevents me from discussing in this place at length the erroneous opinion of those who regard magnesia as a deteriorating element in the estimation of the value of an agricultural limestone. I content myself by expressing my conviction that 2 or 3, or even 10 per cent. of magnesia, will not materially affect the value of the limestone, if it furnishes a lime which slakes well and falls to a fine voluminous powder rich in lime. It should be borne in mind, however, that slaked lime is used in agriculture for the sake of the lime, and not for the magnesia which it contains. Magnesian limestones often contain 20 or even 30 per cent. of carbonate of magnesia, and do not yield quicklime so rich in pure lime as limestones containing naturally more carbonate of lime.

There is another mistake which is frequently made, namely, the mistake of connecting the agricultural value of limestones with the greater or smaller amount of shells and other fossil remains which different specimens present to the eye. It is believed that the more shelly or coralline a limestone is, the better the lime which it is likely to produce. This supposition rests on the assumption that corals, shells, and other fossil remains in limestones contain much phosphoric acid. Neither the alleged fact, that shelly limestones produce better lime than stones comparatively free from fossil remains, is proved, nor does the statement which has been made in explanation of this assumption rest on analytical evidence.

Many exceedingly shelly limestones which I have had an opportunity of examining, notwithstanding their shelly texture, are totally unfit for burning; and some of the worst limes in the neighbourhood of Cirencester are made of the most shelly limestones. I have moreover taken the trouble of examining for phosphoric acids several limestones full of fossil shells, as well as some fossil remains extracted from the oolitic limestones in our neighbourhood, and find neither the shelly limestones richer in phosphoric acid than non-fosiliferous limestones, nor a larger amount of phosphoric acid in the shells than in the matrix in which they are embedded. By far the most valuable property of a limestone is its power to burn in the kiln, so as to produce a solid stone that admits of being removed from the kiln without too much waste, and that in slaking swells greatly, producing a light floury powder. Generally speaking, limestones rich in carbonate of lime possess this valuable property in a high degree; and within certain limits, the amount of pure carbonate of lime in a limestone is a measure of its agricultural value. In a minor degree the proportions of phosphoric and sulphuric acid affect the value of limestones for agricultural purposes; but generally the amount of these fertilising constituents is too inconsiderable to deserve any notice. Should there be much phosphoric acid in a limestone, it is, of course, all the more valuable; and, on the other hand, if there is much sand or oxide of iron, alumina, and other foreign impurities in a limestone, it will yield a quicklime which is deteriorated in value in a corresponding degree.

On the changes Lime undergoes in burning and slaking.—The chief constituent of all limestones, it will be remembered, is carbonate of lime, *i. e.* a combination of lime with carbonic acid. When burned in the kiln the carbonic acid is driven out by the heat, and the lime, mixed with the foreign matter of the limestone, remains behind as caustic, burned, or quicklime. One ton of good limestone, on an average, yields in round numbers nearly 11 cwt. of quicklime or lime-shells. The weight of quicklime per bushel varies greatly with the kind of limestone, and the heat to which it has been exposed; when burnt very high it becomes more compact than at a more moderate heat, and then, of course, is heavier per bushel. Too great a heat should be avoided, especially if the limestone contains much clay or other silicious matters, since such limestones are apt, when burned too highly, to yield a lime which does not readily slake. Such lime is said to be over-burned.

On exposure to a moist atmosphere burned lime slowly attracts water; or by pouring upon it a certain quantity of water, it absorbs the latter at once, heats, and in either case falls to a fine powder. The process is known as slaking, and the product is slaked lime.

The most economical and approved mode of reducing quicklime to fine powder is spontaneous slaking in covered heaps. The lime is laid up in heaps, and covered with grass sods, earth, or the clearings of ditches, and then left for three or four weeks, or until it has completely fallen to powder. Covering with sods and earth excludes to a great extent heavy showers or long-continued rain, whereby the quicklime is apt, at least in part, to run into mortar. Should this take place, notwithstanding the precaution of keeping the heaps covered with earth or grass sods, it is advisable to mix the mortary portion of the heap with the rest, or, better still, with some fresh quicklime, before distributing it over the field.

Some kinds of lime, especially inferior limes, do not slake spontaneously, and require to be watered in order to fall to powder. Slaked in either way, lime greatly increases in bulk—the more the better it is. Good limes generally increase 3 to 3½ times, and seldom as much as 4 times; whilst bad limes, particularly those rich in earthy matter, increase rarely more than twice in bulk, and often less.

Slaked lime contains water in an invisible form, or chemically combined water, and is called by chemists hydrate of lime. 100 parts of lime-hydrate, or dry slaked lime, when pure, contain—

Lime	76
Water	24

Quicklime differs materially in its physical and chemical properties from the stone from which it is obtained. Whilst limestone is hard and dense, and nearly insoluble in pure water, quicklime falls readily to a fine powder, which is soluble in about 770 parts of water. Quicklime has a hot, alkaline taste, and causes, amongst other effects, the resolution of vegetable and animal matters into simple, volatile, or soluble combinations. The changes limestones undergo in burning are thus partly of a mechanical, partly of a chemical kind. The mechanical changes enable the farmer to reduce the lime by slaking into an extremely fine powder, which can be readily and thinly spread upon, or intimately mixed with, the soil. The chemical change consists chiefly in the expulsion of carbonic acid, and the conversion of the mild into caustic lime.

Slaked lime, when exposed for some time to the atmosphere, gradually absorbs carbonic acid, and returns in part to a mild condition, or becomes partly carbonate of lime again. Still, however long lime may have been exposed to the influence of the atmosphere, it never becomes entirely reconverted into carbonate.

With a view of ascertaining to what extent slaked lime, which had been exposed for some months to the atmosphere, had become reconverted into carbonate of lime, I analysed a portion of such lime. The slaked and exposed lime was made from the same limestone (from Williamson) of which an analysis has been given already. The results of this examination are as follows:—

Composition of Quicklime spontaneously slaked by exposure to air.

Moisture, driven off at 212° Fahr.	·78
Oxide of iron and alumina	·29
Silica	·14
Magnesia	·14
Sulphate of lime	·11
Carbonate of lime	15·11
Lime-hydrate	83·43
	100·00

It will be seen that lime slaked spontaneously contains an appreciable quantity of carbonate of lime. The amount of carbonate in slaked lime of course is not constant, but varies with the time during which lime has been exposed to the atmosphere. This lime, like the stone from which it is made, is an exceedingly pure and valuable material, which can scarcely be surpassed by any other lime.

This will be a fitting place to put on record an analysis which I lately made of gas-lime, *i. e.* the refuse lime from gas-works. The lime in the gas-purifier principally answers the purpose of removing from the crude gas, as it issues from the retorts, sulphuretted hydrogen and carbonic acid. The slaked lime consequently becomes more or less changed into carbonate of lime and into sulphuret of calcium, a combination of sulphur with calcium, the metallic base of lime. At the same time some tarry matter, a little ammonia, and other volatile substances, pass into the gas-purifiers, and are in part retained by the lime in a mechanical way.

When gas-lime is first exposed to the atmosphere it gives off a very bad smell, which arises principally from the sulphur compounds in this substance; after some time the bad smell diminishes, and at last becomes almost imperceptible. This shows that the sulphurous compounds in gas-lime undergo changes on keeping, which may be stated briefly to consist in the gradual oxidation of sulphuret of calcium, which, passing through the formation of sulphite of calcium, terminates in the production of sulphate of lime or gypsum. Gas-lime kept for some time thus always contains some gypsum.

From these remarks it will be gathered that gas-lime contains the following ingredients: carbonate of lime, lime hydrate, sulphuret of calcium (mere traces), sulphite of lime, sulphate of lime, small quantities of tarry matters, a little ammonia, water, and, of course, all the impurities which are contained originally in the quicklime employed in the gas-works.

The relative proportions of the chief constituents of gas-lime will be recognised by throwing a glance at the subjoined Table, which gives the composition of gas-lime when dried at 212° Fahr.:—

Composition of refuse Gas-lime.

Water of combination and a little organic matter	7·24
Oxides of iron and alumina	2·49
Sulphate of lime	4·64
Sulphite of lime	15·19
Carbonate of lime	49·40
Caustic lime	18·23
Magnesia and alkalies	2·53
Insoluble silicious matter	·28
	100·00

It need hardly be stated that the composition of gas-lime, for obvious reasons, must be subject to great variations. In fresh gas-lime the proportion of water amounts from 30 to 40 per cent.

Gas-lime, it will be seen, contains a good deal of sulphite of lime, *i. e.* a combination of lime with sulphurous acid. This combination is readily decomposed even by carbonic acid; and as sulphurous acid, which is readily liberated by the carbonic acid in the soil, is injurious to vegetation, gas-lime should not be applied to the land in too fresh a state, for in such a state it is decidedly mischievous even when used in moderate quantities. The safest plan of using gas-lime appears to me to employ it in the shape of a compost. Mixed with refuse matters, whether of animal or vegetable origin, gas-lime, on keeping for five, or better for six, months, becomes transformed into a very useful fertiliser for all soils naturally poor in lime. In fact, gas-lime may be used with equal advantage as quicklime in making lime-compost heaps.

2. *Chalk.*—The localities in the West where chalk occurs are confined to part of Dorsetshire, Wiltshire, and Somersetshire; its agricultural use is naturally confined to the immediate neighbourhood where it is found.

Chalk is a soft kind of carbonate of lime, which often constitutes extensive beds, separated usually by geologists into the upper and lower chalk beds. Neither the upper nor the lower chalk is pure carbonate of lime, but both invariably contain more or less silica, often in the shape of minute silica shells of infusorial animals, besides oxides of iron and alumina, magnesia, and traces of phosphoric and sulphuric acids as potash or soda. In some beds of chalk, oxide of iron occurs in only a minute quantity, whilst in others its quantity is appreciable; hence the white colour of the former and the yellowish colour of the latter.

It is a curious fact that sometimes farmers find it answer their purpose to sink deep pits in localities that are situated on the chalk formation, and to apply the lower chalk to the surface-soil, already containing abundance of chalk. Irrational as this may appear at first sight, this practice finds a ready explanation and defence in modern chemical researches, for these tell us that the lower chalk beds often contain so large a proportion of phosphate of lime that even bones or superphosphate, when used as manures on soils formed by the direct disintegration of lower chalk beds, are without efficacy; whilst on land formed by the decomposition of the upper chalk beds, bones or superphosphate, or even the chalk from lower beds, produce the same striking effect, especially on root-crops, which usually attends the use of phosphatic manures.

There are soils in Somersetshire, I am informed, in the neighbourhood of Ilminster, where superphosphate of lime is of no use whatever; and as here the lower chalk formation prevails, it would be very interesting to ascertain whether those soils on which superphosphate shows no effect contain more than a sufficient quantity of phosphoric acid to answer all the purposes for which superphosphate is employed in agriculture. It must not be supposed, however, that all beds in the chalk formation become richer the deeper they are situated, nor that the beds which are described by geologists as belonging to the lower chalk are necessarily richer in phosphoric acid than those nearer the surface or the upper chalk beds. This will appear clearly from the subjoined Table, in which are arranged the results of analyses of several varieties of chalk, from different beds of the chalk formation. These analyses, made by Professor Way, at the same time may serve to illustrate the composition of different varieties of chalk:—

Analysis of Chalks.

	Lower Chalk.	Lower portion of Chalk with Flints.	Upper Soft White or Free Chalk.	Second Specimen of Upper Chalk.
Clay and sand, insoluble in acid	2·04	·66	1·46	·87
Silicic acid, soluble in acid ..	trace	.. ..	.. ..	.. ..
Carbonic acid	42·14	42·98	41·48	42·57
Sulphuric acid	·31	trace	none	·09
Phosphoric acid	·07	·08	·04	·08
Chlorine	none	none	none	·08
Lime	54·37	55·24	55·72	55·18
Magnesia	·25	·10	·06	·30
Potash	·08	·06	·17	·22
Soda	·19	·14	·02	·21
Protoxide and peroxide of iron .	·55	·74	1·05	·40
Alumina	trace	.. ..	.. ..	.. ..
	100·00	100·00	100·00	100·00

According to these results, good chalk contains from 95 to 98 per cent. of pure carbonate of lime; but neither the samples of the lower chalk nor the upper chalk beds which were analysed contained much phosphoric acid. I cannot help thinking that money is often spent uselessly in the chalk districts in sinking pits and bringing to the surface-soil a variety of chalk which may be harder or somewhat different in colour, but otherwise does not materially differ from the chalk of the upper beds. It is true, phosphate of lime is more abundant in the beds of the lower chalk than in those of the upper chalk, but it is also true that there are beds as poor in phosphates in the lower as those in the upper chalk. Unless, therefore, a bed considerably richer in phosphates is reached in sinking a chalk-pit, labour and money are likely to be thrown away. The analysis of the chalk which it is intended to bring to the surface, with especial reference to the phosphoric acid contained in it, at once would decide the question whether it is desirable to go to the expense of sinking a deep chalk-pit or not.

3. *Marl.*—A third form in which lime is applied to the land is that of marl. The term marl is used often in rather a loose sense, and applied sometimes indiscriminately to all mineral matters which are dug up and put on the land in large quantities. Hence, mineral manures possessing properties widely differing from each other pass by the name of marl; and agricultural writers have to distinguish a great variety of marls: such as clay marls, shell marl, sandy marl, chalk marl, peaty marls, stony marls, dry and wet marls.

I shall not attempt to describe here the properties and application of the different kinds of marls which are used in agriculture, but shall confine myself to a brief account of a few marls which are used in the West of England, and which I had an opportunity of examining. I am aware that there are many marls used for manuring purposes in Devonshire and Somersetshire, as well as in Cornwall and South Wales, which I have not examined. Numerous applications for marls used for agricultural purposes were met with no response, and I had consequently no opportunity to analyse several kinds of marls which I should have liked to examine. However, to confess the truth, I am almost glad that I have not to report on the agricultural value of many specimens of marls, for I am afraid I could not have done justice to the subject in the limited time allowed to me for examining into the various calcareous manures that are found in the West of England, and for reporting on their uses in agriculture.

"The Marls of the West of England, and their uses in agriculture," is a subject quite comprehensive enough by itself, and, when undertaken in a proper manner, will give an analytical chemist plenty of work for a number of months.

The first marl on which I have to report was forwarded to me by Mr. Symes, of Combe, near Sherborne. This marl on analysis was found to contain in 100 parts :—

Moisture and organic matter	5·41
Oxides of iron and alumina	6·94
Carbonate of lime	10·55
„ „ magnesia	1·44
Phosphoric acid	trace
Insoluble silicious matters (chiefly fine sand)	74·86
Alkalies and loss	·80
	100·00

It will be observed that this is a sandy marl, *i. e.* a mixture of some clay with carbonate of lime and much sand. On light soils deficient in lime this marl would produce a beneficial effect, but since it contains so large a proportion of sand and but little lime I doubt the propriety of using it if it has to be carted any distance. At the best it is but a poor sandy marl, which can only do good when used in very large quantities upon light soils quite deficient in lime, or upon heavy land, which is benefited by almost any mechanical ameliorator.

In the next Table I have grouped together the analyses, made some time ago, of three marls found in the West of England.

No. I. is a clay marl from Bridgewater.

No. II. a chalk marl, or malm as it is locally called in Wiltshire.

No. III. another chalk marl from Gloucestershire.

	No. I.	No. II.	No. III.
Water and a little organic matter	3·38	..	..
Finely divided silica (soluble in caustic potash)	17·94	16·710	0·26
Insoluble silicious matter (fine clay)	54·89	6·090	..
Oxides of iron	8·82	·780	2·86
Alumina	6·67		
Lime	1·44	40·757	52·33
Magnesia	0·92	·825	0·31
Potash	1·48	traces	traces
Soda	1·08	traces	traces
Phosphoric acid	0·51	·242	traces
Sulphuric acid	traces	1·546	..
Chlorine	traces	traces	traces
Carbonic acid and loss	2·87	33·050	44·70
	100·00	100·000	100·46

Marl properly speaking signifies a mixture of clay, carbonate of lime, and sand, with or without organic matter, containing not less than 5 or 6 per cent. of carbonate of lime.

It will be observed therefore that No. I. can hardly be called a marl.

There are many similar minerals, which are called by practical men clay marl, since they are used with marked benefit on some soils.

The so-called clay marl from Bridgewater appears to be an alluvial clay. It occurs in reddish brown lumps, readily breaks down on exposure to the atmosphere, and possesses considerable fertilizing qualities. It will be seen that this mineral fertilizer contains a considerable quantity of phosphoric acid and soluble potash, but is very poor in lime. The fine clay which enters into its composition, moreover contains a great deal of potash in an insoluble state, from which, however, it is gradually liberated on exposure to the atmosphere.

There can be no doubt that the fertilizing effects which this clay marl produces are due to the large amount of soluble potash as well as to the phosphoric acid which it contains, and not to the lime. The use of this clay marl will not supersede the application of lime, or of a marl rich in carbonate of lime.

This marl thus presents us with the curious fact that the very best thing that can be mixed with this marl is lime, and that wherever lime is really wanted, as is the case in many soils near Bridgewater, the clay marl occurring in the neighbourhood of this town does not answer the purpose for which lime is usually employed in agriculture.

No. II. occurs in gray lumps at the foot of the Wiltshire Downs. It is largely used by the Wiltshire farmers, both on pasture and arable land.

The proportion of phosphoric acid in this marl is not large, but still it helps to add to its fertilizing effects, which are due principally to the large quantity of carbonate of lime, and perhaps also to the finely divided or soluble silica, which also occurs in abundance in it.

Still larger than in No. II. is the proportion of carbonate of lime in the chalk marl from Gloucester, which is by far the least valuable of these three marls.

Chalk marls on the whole are good fertilizers for all soils deficient in lime, and some produce very beneficial results even when applied to soils containing superabundance of lime. It appears thus clearly that lime in the latter instances cannot be the cause of the fertilizing properties of some kinds of chalk marls. Careful analytical researches indeed have traced the fertilizing effects of some chalk marls chiefly to the phosphoric acid which they contain in the form of phosphate of lime. Phosphatic nodules occur frequently in Wiltshire marls and in some places in Somersetshire. The occurrence of these phosphatic nodules, which in appearance can hardly be distinguished from ordinary chalk marls, is indicative of good soils. In localities on the greensand or lower chalk formation, farmers should have a special look-out for phosphatic nodules, inasmuch as their notice may probably lead to the discovery of Coprolite beds. Unfortunately many phosphatic nodules cannot be distinguished by their physical characters from common chalk marl, and the tests for phosphate of lime are too complicated to enable any one not well acquainted with analytical chemistry to detect with precision the presence of phosphoric acid.

4. *Shell or sea sand.*—Shell-sand is calcareous sand which consists of the fragments of broken shells, corals, silicious sands, débris of granite, and small quantities of animal matter and soluble alkaline salts. It differs much in colour and fineness, &c., as well as in chemical composition, and consequently also in quality. Extensive deposits of shell-sand are found in many parts of the Devonshire and Cornish coasts, for instance at Bude, Barracaine, Northcote Mouth, Hartland Quay, and especially at Padstow. There is an immense deposit of indefinite depth in the estuary of Padstow, from whence it is transported in large quantities to great distances inland. It has been estimated that 4,000,000 of cubic feet are annually employed for agricultural purposes in Cornwall alone, in which county shell-sand is held in high estimation, since it is peculiarly well adapted as a manure for the soils of Cornwall. These soils are generally either stiff clays or poor sands; they result chiefly from the disintegration of the granitic and schistose rocks that abound in Cornwall, and are very deficient in lime; hence the utility of shell-sand, which owes its fertilizing qualities principally to the carbonate of lime which it contains.

Most of the samples of Cornish and Devonshire shell-sand which I examined were supplied to me by my friend and pupil Mr. E. Hockin, of Bude, who also kindly made several shell-sand analyses for me. The results of Mr. Hockin's analytical examinations are embodied in the subjoined tabular statement:—

Composition of Sea-sand (Shell-sand) from Devon and Cornwall.

	Bude.	Comb Martin.	Hartland.	Northcote Mouth.	Summerllege.
Water and organic matter	3·668	6·468	6·420	8·525	2·267
Silicious sand	37·144	68·635	58·322	25·025	29·910
Oxide of iron and alumina	3·397	8·784	4·350	1·768	3·492
Carbonate of lime	53·123	14·138	29·840	62·467	63·067
Magnesia and alkaline salts	2·668	1·975	1·068	2·215	1·264
	100·000	100·000	100·000	100·000	100·000

Before offering any remarks on these analyses, I give the composition of another sample of shell-sand from Bude, which was collected a year after the first sample. The following analysis of Bude sand therefore is calculated to show the variations in composition to which this sand is subject at different times. Grouped together with this analysis is another, made in my laboratory, of a sea-sand from Sandymouth, Cornwall.

Composition of a second sample of Shell-sand from Bude (No. I.), *and Sea-sand from Sandymouth, Cornwall* (No. II.)

	No. I.	No. II.
Water and a little organic matter	2·52	3·51
Oxides of iron and alumina	8·50	3·48
Carbonate of lime	52·59	43·27
,, ,, magnesia	·98	1·70
Silicious sand	35·33	48·29
Chloride of sodium (common salt)	·38	not determined
	100·30	100·25

On comparing these analytical results with each other it will appear:—

1. That the proportions of carbonate of lime in the analysed samples of sea-sand from different localities vary exceedingly. Thus, whilst the sand from Comb Martin contained only 14 per cent., that from Northcote Mouth and that from Summerliege contained 62½ and 63 per cent. respectively.

2. That the samples richest in lime contain least silicious sand, and those poorest in lime the most silicious matter.

3. That the proportion of oxide of iron likewise varies considerably in the sands from different places, which circumstance no doubt explains at least to some extent the various colours of the different kinds of sea-sand analysed by me.

4. That the proportion of soluble alkaline salts in all samples is very trifling.

5. That the specimen of sea-sand from Comb Martin examined in my laboratory is too poor in lime to be profitably carried away any distance.

6. That the sea-sands from Northcote Mouth and Summerliege possess nearly the same agricultural value, and are the best varieties of the samples of sand the composition of which is stated above.

7. That Bude sea-sand varies but little as regards the proportion of carbonate of lime which different samples drawn at long intervals contain.

8. That Bude sand contains rather more than one half its weight of carbonate of lime, and the shell-sand from Sandymouth

nearly 50 per cent., and that therefore both will prove useful fertilizers upon soils deficient in lime.

9. That the shell-sands from Comb Martin and Hartland Quay are inferior kinds of sea-sand, especially the former, since it contains only 14 per cent. of carbonate of lime.

I may observe that I have carefully examined the shell-sand from Bude for phosphoric acid, but have not succeeded in detecting the least trace of phosphoric acid in this species of shell-sand.

This negative result, however, must not be taken as a proof that shell-sand is invariably destitute of phosphoric acid. This is not the case, for I have experienced no difficulty in recognising distinctly the presence of phosphoric acid in several other kinds of shell-sand, but with the exception of the sea-sand from Padstow the proportions of this acid were too small to admit of a quantitive determination.

In the far-famed shell-sand from Padstow, on the other hand, I found an appreciable quantity of phosphate of lime, as well as a considerable quantity of sulphate of lime, both which constituents it need hardly be mentioned add considerably to the fertilizing properties of this species of shell-sand.

A careful analysis of a sample of shell-sand kindly supplied to me by Mr. Bryant of Padstow yielded the following results:—

Composition of Shell-sand from Padstow.

Water and a little organic matter..	1·233
Oxides of iron and alumina	1·686
Phosphoric acid	·228
(equal to bone-earth)	(·491)
Carbonate of lime	80·080
„ „ magnesia	3·176
Sulphate of lime	1·049
Chloride of sodium (common salt)	·314
Insoluble silicious sand	12·127
	99·811

This analysis fully establishes the superiority of the Padstow sand over many other Cornish and Devonshire shell-sands, and shows that 1 ton of one kind of sand may be worth to the farmer as much and more than 4 or 5 tons of another locality.

The amount of phosphoric acid in the Padstow shell-sand analysed in my laboratory corresponds to about ½ per cent. of bone-earth; and considering the large quantities of shell-sand that are often laid on the land, besides much carbonate of lime, an amount of bone-material will be added to it which cannot fail beneficially to affect the crops raised on soils that have received a good dressing of Padstow shell-sand.

II. FUNCTIONS OF LIME UPON THE SOIL AND VEGETATION.

Having described the physical and chemical properties of several kinds of limestones, marls, sea-sand, and other calcareous mineral substances, occurring in the West of England, I shall now proceed to refer to the functions which lime is supposed to exercise upon the land and upon vegetation.

Unless the agriculturist entertain correct views with regard to the theory of the action of lime, he is as likely as not to misapply it and to meet with disappointment. For this reason it may not be out of place to allude briefly to the functions of lime.

There are especially four functions requiring particular notice:

1. *Lime exercises a mechanical effect upon the land to which it is applied.*

Stiff, heavy clay land by its addition is rendered more porous, friable, and consequently better adapted for cultivation. Sandy, light soils, on the other hand, when limed, are consolidated, and thus improved in their physical condition.

2. *Lime supplies food to plants.*

All naturally fertile soils contain a notable proportion of lime, while in those which are naturally unproductive the quantity of lime is comparatively small. It is on soils of the latter description that lime is added with much benefit; and we may therefore safely conclude that it is really indispensable to the fertility of the soil.

All our cultivated plants on burning furnish ashes, containing more or less lime. It thus appears that it is a necessary food of plants without which they cannot come to perfection; and as plants have not the power within themselves to generate lime, we can readily understand the benefits which result from its application to soils naturally deficient in it or impoverished by long-continued cropping.

The quantity of lime actually removed from the soil by different crops varies considerably. Some plants require a much larger amount than others. Thus it has been found that in the produce of an acre of land of the following crops there is contained of lime:—

			Lime in the Grain. lbs.	Lime in the Straw or Roots. lbs.	Total. lbs.
Wheat	25	bushels	1	12	13
Barley	40	,,	1½	15½	17
Oats	50	,,	3	19	22
Rye	26	,,	1½	15½	17
Beans	25	,,	2	34	36½
Turnips	20	tons	46	72	118
Potatoes	8	,,	8	31	39
Red clover	2	,,	..	77	77
Rye grass	2	,,	..	30	30

The different quantities of lime which are removed by those crops partly, no doubt, explain why lime favours the growth of some crops more than others, and partly also why it is necessary to renew the process of liming from time to time.

3. *Lime exercises a beneficial effect upon the organic matters in the soil.*

Organic matters are present in all soils in larger or smaller quantities: and under good cultivation their proportion increases in ordinary circumstances every year. Now although organic substances on the whole are beneficial to vegetation, they will cease to be so when they have accumulated in too large a proportion. Lime, on account of its caustic properties, greatly facilitates the destruction of organic matters, and thus prevents their accumulation to an injurious extent. Hence lime is frequently added to compost heaps with a view to hasten the decomposition of both vegetable and animal matters, and it has been found to answer that purpose exceedingly well. Lime no doubt exercises an analogous effect upon the organic matters in the soil. During the decomposition of the organic substances, carbonic acid is produced in abundance, and also a small quantity of nitric acid. Both carbonic and nitric acid are highly conducive to the luxuriant growth of plants; and their production, under the influence of lime, consequently accounts in some degree for the beneficial effects of liming.

The roots, leaves, and other vegetable remains of former crops, in a comparatively fresh or undecomposed state, it is well known, scarcely produce any fertilizing effect upon vegetation, but they become excellent fertilizers when their organic tissue has been more or less destroyed by the process of decay or putrefaction. They then become converted from an inert to an active state, and in this state exercise a beneficial effect upon vegetation. Now lime possesses the power of hastening the change of inert vegetable matter into active fertilizing substances, and will therefore prove especially useful on soils abounding in organic matter.

Its alkaline properties moreover render lime peculiarly applicable for neutralizing any free acid existent in the soil. The prejudicial effects of sour humus on vegetation, as exhibited in the produce of boggy or peaty land, are well known to practical men, and also the benefit which results from an abundant supply of caustic lime to such land. Lime not only combines with the organic acids constituting the sour humus and thus sweetens the soil, but it also hastens the decomposition of the organic matters which give rise to the formation of sour humus, and thus removes also the cause of its injurious effects.

Whilst speaking of the action of lime on organic matters, we would not forget to mention that all organic substances contain inorganic or mineral constituents in an intimate state of combination. From this close union the mineral matters, however, cannot be removed by water, even when they are as easily soluble as potash or soda. As long as the organic tissue of the roots, leaves, and other vegetable matters in the soil remain unaltered, potash, soda, sulphuric and phosphoric acid, and other fertilizing mineral matters which are united with them, will remain unavailable to the use of plants. But in the measure in which the decomposition of the organic substances proceeds, the inorganic are liberated and can then be applied to the benefit of the growing plants. And as lime hastens the decomposition of all organic matters, its beneficial effects upon vegetation partly, no doubt, are attributable to the liberation of inorganic or mineral fertilizing substances, which it promotes in a great measure.

4. *Lime exercises a beneficial effect upon the inorganic matters in the soil.*

Although the effects of lime are most conspicuous on soils rich in organic matters, it is not inactive on land deficient in such matters. Lime not only facilitates the decomposition of organic substances, but effects also important changes in the mineral constitution of soils. In particular we would mention its effects upon many silicates. By causing their decomposition in the soil, lime sets free potash and soda, two substances highly conducive to the luxuriant growth of many plants.

In many soils, but especially in clay land, we find portions of granite and other minerals from which clay has been originally produced. These minerals are the chief sources from which the necessary amount of alkalies, required by plants, is furnished. But as their decomposition proceeds slowly, a long time must pass before potash and soda can be set free. Lime materially hastens this decomposition, and can be compared in this particular action to the effects which prolonged fallow produces upon land.

If it only acted beneficially in converting inert vegetable substances into actual fertilizers, the beneficial effect upon clays that are nearly destitute of organic substances would be perfectly unintelligible. This action, however, fully accounts for the effects of lime upon clay land.

We thus see that the action of lime on vegetation depends on more than one cause; and that consequently its effects in that respect will be influenced by the various circumstances under which it is applied to the land.

At the same time, the four different functions which we have mentioned as belonging to lime, point out to us the uses of lime in agriculture, and the benefits which are likely to result from its application.

On the exhausting Effects of Lime.

The use of lime, like that of many other good things, is often turned into abuse, and the failures which have resulted from the injudicious application of lime have brought this valuable fertilizer into disrepute with some, who ascribe to it an exhausting effect.

It is the opinion of some practical men that liming will render ordinary manuring unnecessary, and the acting upon this principle in many instances has done much injury. This, however, is a great mistake. The fact is, lime applied by itself is incapable of supplying all the wants of the growing plant, and is therefore not calculated to supersede the use of farmyard-manure. If, notwithstanding the non-application of any other manure than lime, good crops have been raised, this fact proves simply that the land has been in excellent condition. We can, however, confidently predict that sooner or later the produce will gradually sink, and at last the soil will cease to bear remunerative crops. This is indeed so well known to practical men, that many consider the use of lime prejudicial to the permanent productiveness of the soil. When, however, care is taken to apply manure in sufficient quantity to limed land, no fear ought to be entertained that lime will exhibit any exhausting effects. We have seen that lime, by rendering the hidden mineral treasures of the soil available to the immediate use of plants, especially by liberating potash and soda from the insoluble combinations in which these two alkalies exist, greatly increases the luxuriant growth of plants. It has been shown, also, that it converts inert vegetable substances into actual fertilizers, but that lime itself has not the power of supplying all the substances which, through its instrumentality, are rendered available to plants. It follows therefore, as a necessary consequence, that they will grow languidly as soon as the supply of these fertilizing materials in the soil falls short. Hence arises the necessity of supplying them in the form of farmyard manure. If we wish to grow abundant crops we must supply the materials necessary for their existence, and the more liberally these are presented to the young plant the more likely are we to succeed.

Lime certainly possesses the great advantage of rendering available the inert fertilizing matters in the soil, and has also the effect of bringing farmyard manure into a rapid action, but it cannot itself supply the materials upon which it works. The use of lime thus stimulates to a vastly increased produce, which must draw largely on the resources of the soil. Now, as lime restores only a small quantity of those substances which plants require, it is most unreasonable to expect that the fertility of the land will be maintained by lime alone.

To keep land in good condition, we must, as a general rule, add as much of everything as we carry off in the produce. The judicious farmer, therefore, will apply all the materials which are demanded by the increased produce in larger quantities than by a scanty crop; and this he does by liberally adding manure to the land, and not merely by using lime as a substitute for manure. If manure is liberally added to limed land, no exhaustion need to be feared.

On the other hand, the neglect of this principle, which ought to be kept in view by every one cultivating land, must be attended with a more speedy exhaustion than when no lime is used; for we cannot constantly take out of the land a number of fertilizing substances, and add only one material, without impoverishing it.

On the Crops most benefited by Liming.

We have stated above that all cultivated plants require lime as an essential article of food, without which they cannot come to perfection, and it is therefore evident that it will increase the produce of all crops on soils naturally deficient in this substance. But as lime exercises several important functions in relation to the vegetable processes, we may expect that its application to some crops will be characterised by a more marked effect than to others. Practical experience confirms this supposition, for it is well known that liming not only improves the quantity and quality of some crops in an especial manner, but that it alters as well the natural produce of the land, by killing some kinds of plants and favouring the growth of others.

The crops which are especially benefited by liming are: clover, rye-grass, and natural grasses; sainfoin, peas, beans, and vetches; turnips.

The effects of lime upon clover and rye-grass are strikingly beneficial; and for this reason perhaps on no description of crops is lime applied so advantageously as upon white clover and artificial grasses. It causes white clover and rye-grass to thicken, and to produce a closer sole every succeeding year the land remains in pasture, and thus contributes greatly to enlarged crops.* Not only is the quantity of the clover crop increased, but its quality is also materially improved. Clover and rye-grass, when grown on limed land, are far more juicy and nutritious than when grown on unlimed land.

On many soils it is indeed impossible to cultivate, economically, clover or rye-grass without a heavy dose of lime; and land which previously to liming was quite unfit for the cultivation of these crops, after the addition of a good dose of lime, has given a heavy produce of superior quality.

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* Lime, when applied as a top-dressing upon dry lands that have not even been cultivated, on Exmoor, has the magical effect of producing white clover in quantity, without its being sown.—R. S.

On limed land, moreover, clover is less exposed to the failure which is known under the term of clover-sickness. Although we would not in every instance ascribe the cause of land becoming clover-sick to its deficiency in lime, I have no hesitation in asserting that in many cases the failure of clover can be traced to the want of lime in the soil upon which it is attempted to be grown.

On natural grasses, especially on benty grass, the best farmyard manure often produces little improvement until a dressing of lime has been applied.*

In arable farming, where the land remains in pasture two or three years, the liberal use of lime is attended with the greatest benefits. Lime destroys the coarser grasses and favours the growth of a sweeter and more nutritious herbage. The superior quality of limed pastures has long been known to practical men; and this superiority is fully accounted for by the effects of lime in changing the natural produce of the land.

Old pastures are best limed in the beginning of the winter; the lime will then be washed into the soil, and come in reach of the roots before the new growth starts.

Lime kills moss, heath, feather grass (holcus mallis), soft meadow grass (holcus lanatus), and other plants, characteristic of peaty land, and is therefore a valuable means for improving peaty or mossy meadows.

Peas, beans, and vetches grow much more luxuriantly in limed than in unlimed land, and yield a larger crop of grain as well as of straw. Peas grown on newly limed land are excellent boilers, and more pleasant to the taste than when grown on unlimed land. By the application of a heavy dose of lime to clay land on which peas or beans did not succeed the produce has been doubled in many instances.

Sainfoin and Lucerne are also materially benefited by a dose of lime, as they are plants which like peas and beans require a larger proportion of it than most other plants.

Lime also exercises a highly favourable effect upon turnips, inasmuch as it improves both the quantity and quality of this crop. It is most efficient when applied in the compost form, and when the land is already rich in organic matters, and should be laid on when the ground is prepared for the reception of the seed.

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* This result has been singularly verified on an Exmoor farm, the action of farmyard manure being found threefold *after* a dressing of lime.—R. S.

In land naturally deficient in lime turnips will refuse to grow, or, if they grow, will produce a scanty and irremunerative crop. Unlimed land, moreover, is liable to give rise to the disease, in turnips, called "fingers and toes." This is so well known to practical men, that lime is considered by many a specific remedy against this disease, and the appearance of the disease itself in turnips as an indication of the propriety of reliming the land. Professor Johnston also states it as his opinion—"That the cure of this disease appears to be the application of a large dose of lime to the stubble-land in the autumn, after it has been turned up by the plough."

Turnips grown upon peaty land, it is well known to practical feeders, are hardly worth being consumed by fattening stock.

On the other hand, those grown on the rich turnip soils of the Lothians are very nutritious. These soils, being formed by the disintegration and decomposition of trap and other similar rocks, often contain a considerable amount of lime, and we may therefore infer that lime exercises a direct influence in the production of a large amount of nutritious substances.

Potatoes when grown upon heavy land or wet clay soils are improved both in quantity and in quality by the application of lime. On heavy wet land potatoes, it is well known, are generally waxy, and the addition of lime to such land has the effect of making them more mealy and agreeable to the taste. On light soils the use of lime is said to diminish this crop.

Upon corn crops lime also acts beneficially. On clay land especially it greatly increases the produce in grain and straw. Whilst it has the effect of hardening the straw of wheat, at the same time it produces a finer and heavier grain, yielding more flour. The improvement which lime is capable of effecting upon grain crops is more marked on stiff than on light soils; and greater on barley than on wheat or oats.

Barley, of all the corn crops, is most benefited by the use of lime, and oats appear to derive the least benefit from its application. Still I have no doubt that, on clay soils, oats will be much improved by lime. On light gravelly soils oats suffer by the too abundant use of lime, and it ought therefore to be applied in small doses, just sufficient to keep the land in proper condition for the cultivation of turnips and grass.

III. ON THE APPLICATION OF LIME, MARL, AND SHELL-SAND, WITH SPECIAL REFERENCE TO THE SOILS IN THE WEST OF ENGLAND.

On the Quantity of Lime usually added to Arable Land in the West of England and in other Districts where Land is limed.

It is a point of much practical importance to the farmer to know in what quantities he should apply lime to the land.

General rules, however, cannot be laid down in this particular any more than in many other agricultural practices, since many circumstances—as, for instance, the character of the land, the nature of the crop intended to be raised, the previous application of lime, the price and convenience at which lime can be procured—must necessarily exercise a great influence on the quantity of lime most profitable to the land.

Where lime is cheap and the soils very deficient in it, as in many parts of Somersetshire and Devonshire, the quantity of lime added to the land is naturally larger than in other districts where the expense of hauling lime is very considerable, or upon soils which, although benefited by lime, do not yield so large an increase of produce as others.

I shall have to notice presently the composition of several soils in Somersetshire and Devonshire which are naturally deficient in lime, and which but for the want of this element would be extremely fertile. On land of that description, I believe, according to many leases the tenant is obliged to put on his land 10 hogsheads of lime for every breaking crop. This is the usual quantity of lime which the landlord requires his tenant to put on the land on the Brandon hills, and about the same quantity is used in some parts of Devonshire. Often, however, only 8 hogsheads are used every five years, to which practice no objection is made by a good landlord if the tenant can show that he has purchased artificial manures for the money saved in applying less lime to the land than required by the lease.

In most districts of South Wales, where lime can be readily procured, 4 loads of lime of 25 bushels each for every breaking crop are considered a good dressing for light land, and 6 to 8 loads for heavy land. Often, however, lime is used in larger quantities, to the injury of the land, upon which at first it exercises a wonderfully beneficial effect, the effect becoming less perceptible and finally ceasing altogether if the application of larger doses of lime is repeated too frequently.

As it may be of some interest to farmers in the West to know what quantities of lime are added to the land in other counties where liming has been successfully practised, I subjoin a Table, in which are considered the proportions usually added on some of the best cultivated districts:—

Quantity of Lime applied per imperial acre in different districts.

	Bushels.		Years.		Bushels in a Year.	When applied.
Roxburgh	200	every	19	or	10½	To the fallows.
Ayr (Kyle)	40	„	5	„	8	To the fallows or lea.
Carse of Stirling ..	50	„	6	„	9	Do. do. do.
South Durham ..	90	„	12	„	8½	Do. do. do.
Worcester	70	„	6 or 8	„	10	Before grasses and tares.

It thus appears that in these counties 8 to 10 bushels a year are pretty uniformly applied. On very stiff soils or on peaty land a larger dose no doubt can be used with advantage, but on light soils it is advisable to use it in smaller doses.

Some farmers prefer using large doses at once; whilst others maintain that repeated dressings with smaller doses are attended with the greatest amount of practical benefit.

There can be little doubt that, on soils abounding in vegetable matters or wholly destitute of lime, a large quantity will be required at once to change their mechanical and chemical constitution; and the propriety of liming the land heavily at first is thereby indicated.

But, when land has been brought by cultivation into good condition, the safest plan to maintain it in fertility will be to supply lime at shorter intervals with smaller doses, at the rate of about 8 bushels a year.

Repeated liming with small doses at larger or shorter intervals, indeed, is necessary to keep the land in its maximum state of productiveness. The reasons for the practice are obvious.

In the first place, the well-known tendency of lime to sink deeper and deeper into the soil, from year to year, removes the lime from the surface into the subsoil, and thus takes it out of the reach of the roots of plants. This tendency to sink is greater in light and porous soils than in heavy; but even in very stiff land lime gradually sinks and passes into the subsoil. Hence the necessity of applying it as near as possible to the surface.

Secondly, heavy rains wash it down into the lower strata, and dissolve also considerable portions of it. It is on account of this dissolving action that badly drained soils require to be more frequently limed than those which are well drained.

In the third place, it will be remembered that all our cultivated crops remove a certain proportion of lime from the soil; and as some crops take up a much larger quantity than others, the course of cropping must necessarily influence the period at which liming ought to be repeated.

On the Application of Lime to different kinds of Soils, and the Composition of Soils benefited by Liming.

It has been noticed already that the efficacy of lime as a fertilizer is influenced greatly by the character of the soil to which it is added; and as soils vary greatly in their chemical characters, it appeared to me a useful inquiry to ascertain the composition of some soils occurring in the West, upon which lime is usually employed. Mr. Cotterell at Bath very kindly assisted me in this inquiry by procuring for me a good many soils from various parts of Somersetshire and Devonshire. These and other soils from Wales and Cornwall were specially analysed with reference to the present inquiry on the use of lime in agriculture.

A very minute analysis, in which every constituent is ascertained, however small its quantity, was considered to lead to no useful result; I therefore confined myself to the careful determination of the chief constituents of soils, and was thereby enabled to examine a much larger number of soils than I could have undertaken had each been submitted to a minute analysis.

The soils upon which lime is used successfully in the West are clay soils, peaty and marshy soils, and light sandy soils; and since the effect of lime is somewhat different upon each of these three kinds of soils, I shall notice some particulars respecting the use of lime upon each of these three classes of soils separately.

On the Application of Lime on Clay Soils and the Composition of Clay Land much benefited by Liming.

There are many clay soils in Somersetshire and Devonshire which are much benefited by the application of lime, since they are greatly deficient in it. Thus all the clay soils in the districts where the old red sandstone rocks prevail are much benefited by liming; indeed there are few stiff clay soils which will not be greatly improved by the liberal use of lime. Thus on the stiff clays near Honiton lime is very usefully employed; and as soils like those from Hembury Fort, near Honiton, of which an analysis is appended, are naturally rich in all the mineral elements required by our cultivated crops, no fear need be entertained that repeated dressings of lime will permanently injure the land.

Composition of two Stiff Clay Soils from Hembury Fort, near Honiton.

a. Mechanical Analysis.

	No. 1.	No. 2.
Moisture	2.68	3·34
Organic matter and water of combination	5·22	4·15
Lime	2·42	2·71
Fine sand	32·55	22·19
Clay	57·13	67·61
	100·00	100·00

b. Chemical Analysis.

	No. 1.	No. 2.
Moisture	2·68	3·34
Organic matter and water of combination	5·22	4·15
Oxides of iron and alumina	7·61	11·52
Carbonate of lime	2·42	2·71
Magnesia and alkalies	1·74	1·36
Insoluble silicious matter (chiefly clay)	80·33	76·92
	100·00	100·00

The first of these soils is a stiff red soil, which contains a few flints, but is otherwise free from stones. It dries up to a hard mass like bricks, and is full of white particles, showing that this soil has been liberally limed.

The second soil resembles the first very much in its general characters, and also exhibits white particles of lime. It is evident that these soils are naturally poor in lime, and therefore much improved by liming.

The red clay soils, situated on the old red sandstone formation round Torquay, also are much benefited by lime, for naturally these soils contain but little lime, and the lime mentioned in the subjoined analysis of a soil from the estate of Mr. Brunel, near Torquay, arises chiefly from the artificial supply of this element.

Composition of Red Clay Soil from the neighbourhood of Torquay.

Moisture	5·700
Organic matter and water of combination ..	6·820
Oxides of iron and alumina	8·920
Carbonate of lime	2·580
Magnesia	·249
Potash and soda	·471
Soluble silica	·880
Insoluble silicious matter	74·380
	100·000

More friable red coloured clay soils, containing more sand than the preceding but naturally very deficient in lime, abound in the neighbourhood of Wellington and Bridgewater, as well as in many other localities in Somersetshire and Devonshire. In order to present at a glance the chemical characters of these kinds of soils, I have arranged in a tabular form a number of analyses of soils which I had an opportunity of examining:—

Composition of Soils from Bridgewater (No. I.), *Wellington* (No. II.), *and Totnes* (Nos. III. and IV.).

a. MECHANICAL ANALYSIS.

	No. I.	No. II.	No. III.	No. IV.
Moisture	1·15	1·27	14·90	11·68
Organic matter and water of combination	8·45	4·36	6·48	8·58
Lime	2·47	·92	·74	2·98
Sand	43·50	58·08	53·70	58·90
Clay	44·43	35·37	24·18	17·86
	100·00	100·00	100·00	100·00

b. CHEMICAL ANALYSIS.

	No. I.	No. II.	No. III.	No. IV
Moisture	1·15	•	14·90	11·68
Organic matter and water of combination	8·45	•	6·48	8·58
Oxides of iron and alumina	8·47	•	22·65	24·11
Carbonate of lime	2·47	•	·74	2·98
Magnesia and alkalies	1·04	•	1·01	1·45
Insoluble silicious matter..	77·62	•	54·22	51·20
	100·00	•	100·00	100·00

The first of these soils is reddish coloured, tolerably friable soil, from the farm of Mr. Poole, near Bridgewater. It contains particles of lime, showing that it has been limed at some time or other.

No. 2, a red-coloured soil from the neighbourhood of Wellington, is very similar to the Bridgewater soil, and bears a bad character as a wheat-growing soil; however, I believe unjustly so. It is very poor in lime, and will no doubt be benefited by liming.

The two last mentioned soils were sent to me by Mr. Watson of Dorsely, near Totnes, who describes No. III. as a soil from a field in good fertile condition, and No. IV. a soil from an adjoining field of precisely similar character, but not in such good heart, having been more cropped of late years. Mr. Watson further observes in his letter to me, "the soil is good for corn and roots, but yet does not grow as much corn in proportion to the bulk of straw as I fancy it should: probably climate may prevent it. I have found superphosphate, guano, and bones, and also oil-cake manure, all to have good effects. I have doubts, however, on the question of the application of lime, and it is on this point more particularly that I now beg your attention." I give this extract of Mr. Watson's letter, because it is well calculated to throw light on the use of lime on soils similar to those in the neighbourhood of Totnes.

It will be observed that the soil which is described as one in rather exhausted condition contains nearly 3 per cent. of lime, and No. III., described as a good fertile soil, only ¾ per cent. Surprised at the result of my analyses, and fearing the boxes in which the soils were sent had been mislabeled, I wrote to Mr. Watson again on the subject, and learned from him that No. IV. was well limed in 1843 and again in 1851, but No. III. had not been limed since 1840.

These are interesting facts, for they show us in the first place that a soil may be in a good fertile condition, though it may contain but ¾ per cent. of lime, and secondly that Mr. Watson's supposition respecting the use of lime was well founded, for No.

IV. contains more than sufficient of lime to answer all the requirements of the crops of a rotation, and the further addition of fresh lime therefore could not do any good (so far as the supply of constituents of plants is concerned). Indeed it may be questioned whether the repeated liberal doses of lime have not hastened the exhaustion of this soil in grain-producing constituents. This circumstance led me to determine the quantity of phosphoric acid, which I found to amount in this soil to only ·147 per cent.

There can thus be no doubt but that superphosphate and other phosphate manures will much improve this and similar soils, and I cannot help thinking that there are many soils in Devonshire, Somersetshire, Cornwall, and South Wales, upon which a portion of the money now spent in the purchase of lime or shell-sand might be much more economically laid out in the purchase of artificial manures, especially those rich in phosphates; or in the purchase of oil-cake, the consumption of which on the farm would tend to produce a much more valuable manure than is found at present on many farms, especially in Wales and some parts of Devonshire.

The rocks on which Mr. Watson's soils rest have also been analysed by me, and as their composition may be of some interest, I subjoin a Table which contains the results of analyses of three rocks from Dorsely.

No. I. is a specimen of the rock immediately under the soil. It is a brown-coloured rock.

No. II. is a specimen of the rock subjacent to No. I. Colour of rock bluish-grey, occurring at a depth of from 2 to 6 feet.

No. III. shows the intermixture of No. I. and II.

	No. I. Brown Rock.	No. II. Blue Rock.	No. III.
Water of combination	6·274	4·360	3·02
Oxides of iron and alumina	27·854	26·452	28·02
Phosphoric acid	·250	·508	·29
Carbonate of lime	1·234	10·040	8·04
Magnesia	3·008	*2·008	*1·96
Insoluble silicious matter	61·274	56·580	58·67
	100·538	100·000	100·00

Comparing these results with each other, it will be observed that the brown rock contains very little lime, and just half the amount of phosphoric acid which is contained in the blue rock on which the brown rock rests, whilst there is no less than 10 per cent. of carbonate of lime in No. II. The rock No. III. contains 8 per cent. of lime and less phosphoric acid than No.

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* Determined by loss.

II., but more than No. I. The brown rock in all probability is formed from the blue rock; and it is to be regretted that the soil does not rest upon this rock, for a decomposition of this rock would furnish a very fertile soil.

The geological disposition of the rocks in South Devon is extremely interesting, and it is to be hoped that practical geologists like Mr. Whitley, of Truro, chemists and practical observers, will combine together in their labours, which then no doubt will bring to light facts valuable to the occupier of the land.

Again, on the clays of the granite and clay-slate, lime is of the greatest utility. These two formations prevail in Wales and Cornwall, and hence the soils in those parts often stand in need of lime. This will appear by throwing a glance at the subjoined Table, in which the composition of four soils from South Wales is given:—

Composition of four Soils from Wales.

	No. I.	No. II.	No. III.	No. IV.
Moisture	3·93	4·94	5·93	4·57
Organic matter and water of combination	5·23	7·65	7·53	9·30
Oxide of iron and alumina	6·37	13·11	7·28	10·15
Carbonate of lime	8·07	·93	1·10	1·30
Insoluble silicious matters (clay and sand)	75·47	73·18	77·81	73·29
Magnesia and alkalies (principally magnesia)	·93	·19	·35	1·39
	100·00	100·00	100·00	100·00

No. I. is a soil from Penally, 2 miles from Tenby; it contains fragments of slate and is full of bits of lime. It has evidently been limed in enormous quantities, for it requires about 400 bushels of burned lime per acre to add 2 per cent. of lime to a soil of only 6 inches in depth, and naturally the Penally soil hardly contains any lime. I am informed that this soil produces only middling crops, and that a large dose is required to produce any effect upon it.

The wonder to me is that lime does produce any effect at all. Chemically, *i. e.* as a manure, it certainly cannot act on land limed to such an extent, and it is plain that lime can only act beneficially in a mechanical way, which will explain at once why large doses are necessary to produce any effect.

No. II. is a very heavy soil from Tallybont farm, in Lawhaden parish, near Narbeth. It is described to me as a good soil.

No. III. is a soil from Greenway farm, near Narbeth. It is a lighter soil than No. I., and is described to me as a very good soil, which rents at about 3*l.* an acre. It is said to require but little lime, and to produce excellent pasture.

No. IV. is a poor soil from Tegfynydd in the parish of Llanfalteg, county of Carmarthen.

This soil has been limed in 1853 with 5 tons of lime to the acre, and produced, in 1854, 20 bushels of wheat, in 1855 a crop of barley, in 1856 oats; in the winter of 1856 it was covered with about 5 tons of manure per acre, and was growing in 1857 clover and oats.

I abstain from making any remarks on these data, which to the intelligent agriculturist speak volumes.

On the Application of Lime to Peaty Soils on Land long out of Cultivation.

Practical men are all agreed that new land, or long pastured land, should be heavily limed when brought into arable cultivation. On such land lime should be applied in no less quantities than 150 bushels per acre; and when it can be had at a cheap rate it may even be used with advantage at the rate of 250 to 300 bushels per acre.

Having pointed out the peculiar disorganizing action of quick-lime on vegetable matter, greatly abounding in such land, it will not be necessary again to enter into a lengthened discussion of the causes of the beneficial effects which lime is capable of producing under these circumstances. Suffice it to say that it converts the abundance of vegetable substances in such soils into food for plants, improving at the same time the physical condition greatly.

Peaty soils especially will be greatly improved by a heavy dressing of quick-lime; and it is on such land that lime must be used in large doses to produce at once a decidedly beneficial effect.*

In peat land the proportion of organic matters often amounts to from 50 to 60 per cent., and it is therefore evident that much lime is required to effect the decomposition of so large a quantity. It may be laid down as a general rule for our guidance, that the greater the proportion of vegetable matter in the soil the more safely lime can be employed in large doses.

Land that has lain long in grass, when broken up is generally full of couch, larvæ of insects, and worms. A good dose of quick-lime will be found most useful in destroying these nuisances and converting them into food for plants.

On inferior pasture land a dressing with lime and salt has the effect of producing a finer herbage, and may therefore be used with advantage for keeping down the coarser grasses and inducing the growth of a more delicate and nutritious herbage.

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* Such is the immediate effect of a heavy dressing of lime upon cultivated peat soils, that it is found practically useless without it to plant them with corn crops, as the crops become lodged, and in many cases rotted upon the land; while succulent crops are very profitable.—R. S.

In illustration of the uses of lime on pasture land I append the analyses of three pasture soils:—

Composition of Soil from Shepton Mallet (No. I.); *Claverton* (No II.); *and from Kingston Seymour, Congressbury* (No. III.).

a. MECHANICAL ANALYSIS.

	No. I.	No. II.	No. III.
Moisture	3·54	..	2·31
Organic matter and water of combination	18·96	16·80	9·52
Lime	2·18	·75	1·59
Sand	23·53	32·66	35·51
Clay	51·79	49·79	51·07
	100·00	100·00	100·00

b. CHEMICAL ANALYSIS.

	No. I.	No. II.	No. III.
Moisture	3·54	..	2·31
Organic matter and water of combination	18·96	16·80	9·52
Oxides of iron and alumina	13·05	16·08	12·90
Carbonate of lime	2·18	·75	1·59
Insoluble silicious matter	61·75	64·36	72·60
Carbonate of magnesia	..	1·56	..
Magnesia and alkalies	·52	alkalies ·45	1·08
	100·00	100·00	100·00

The soil from Shepton Mallet, it will be observed, contains a great deal of vegetable matter, present principally in the shape of undecayed and partially decomposed roots. This is a stiff dark-coloured clay soil, which dries up into hard lumps.

In the soil from Claverton there is also a considerable quantity of organic matter and clay, and comparatively speaking little sand. Like the preceding soil, it is of a stiff nature, and contains very little lime.

The third analysis represents the composition of marshy land from Kingston Seymour. It is a marshy, dark-coloured, almost black soil, which is free from stones, and dries up to hard masses like brickbats. The dark colour is due to the presence of imperfectly decomposed vegetable remains. All three soils, but more especially the one from Claverton, would be greatly benefited by heavy dressings of lime.

In the marsh land the proportion of lime is smaller than in the two other soils, and yet its colour is much darker. This appears to me to indicate that the land is badly drained, and that the effect of lime probably will not be so marked upon this soil as on others of a similar composition.

In badly drained soils organic matter rapidly increases; the land becomes more and more marshy or peaty. This defect can only be successfully remedied by thorough drainage, and by subsequently applying lime or marl if necessary. Lime used before the land is well drained can only lead to disappointment, for lime does not destroy readily an excess of organic matter if the air is excluded, as is the case in imperfectly drained soils.

On the Application of Lime to Light Soils deficient in Lime.

Light land, no less than heavy, is often much benefited by marling or liming. In fact, all soils, whether light or heavy, are rendered more fertile by the use of lime, if they are deficient in this substance, so essential to the healthy growth of plants. Sandy soils are often very poor in lime as well as in clay and in organic matters; they are open, readily admit air, and allow the rain that falls upon them rapidly to carry into the subsoil, not only soluble matters, but also finely divided powdery matters, such as slaked lime. Every farmer knows that lime has a tendency to sink in the ground, and that this tendency is greater in light than in heavy soils. For this reason it is more advisable to lay on lime sparingly on light land, and to renew the application of lime at shorter intervals, than to put at once a heavy dressing and to allow a longer period to intervene before the application of lime is renewed.

On sandy soils deficient in lime turnips and swedes are very apt to become "fingered and toed." There is nothing which so effectually cures this evil as a dressing of about 2 tons of lime and as much long dung as can be spared, applied in February when the land is ploughed for the turnip crop, and the subsequent application of 1½ cwt. of superphosphate, which it is best to drill with the liquid-manure drill, on sowing the turnip crop; or 2 cwt. of superphosphate and 1 to 1½ guano, if farmyard-manure cannot be spared in sufficient quantity to give the land a good dressing. On the whole, 2 to 3 tons of lime per acre may be regarded as a good dressing for light sandy soils, and this quantity, generally speaking, should not be exceeded.

Where marl, or chalk, or shell-sand can be readily procured, it is advisable to use these fertilizers in preference to quicklime upon light sandy soils. Good marl, especially, produces excellent effects upon sandy soils, where it supplies not only lime but also clay, in which sandy soils are always deficient. Morever, in the shape of marl, lime is not so readily carried into the subsoil as when used as slaked lime.

These general remarks on the use of lime upon light land are further illustrated by the subjoined analyses of three soils found in the West of England:—

Composition of Soils from Yatton (No. I.) ; *from Combe, near Sherborne* (No. II.) ; *and Soil from Montacute* (No. III.).

a. MECHANICAL ANALYSIS.

	No. I.	No. II.	No. III.
Moisture	2·47	•	3·65
Organic matter and water of combination	4·10	•	5·78
Lime	1·92	•	1·48
Sand	75·45	•	53·30
Clay	16·06	•	35·79
	100·00	•	100·00

b. CHEMICAL ANALYSIS.

	No. I.	No. II.	No. III.
Moisture	2·47	5·50	3·65
Organic matter and water of combination	4·10		5·78
Oxides of iron and alumina	5·58	2·83	8·01
Carbonate of lime	1·92	·40	1·48
Magnesia and alkalies	·73	·77	1·28
Insoluble silicious matters	85·20	90·50	79·80
	100·00	100·00	100·00

The soil from Yatton is a sandy dead-looking soil, showing here and there white particles of lime or chalk. It is tolerably free from stones; the stones are as hard as flint, and some are reddish-coloured like jasper. This soil probably has been limed at one time or the other, and, although it may not want to be limed immediately, it may be safely predicted that it is one of those light soils that require a periodical dressing of lime.

In the soil from Combe, near Sherborne, hardly any lime occurs, and no less than about 90 per cent. of silicious sand. It is self-evident that marl or lime will much improve such a soil; but since this soil is also deficient in other fertilizing constituents, farmyard-manure, or a mixture of guano, superphosphate, and salt, should be used as well as lime or marl if the soil is to yield good crops. Lime used by itself upon such soils, which are but little better than blown sand, answers no useful purpose.

A much better soil than that of Yatton or Combe is the soil from Montacute. This is a lightish loamy soil, which ought to grow good turnips, as it is readily pulverised. It exhibits white particles of lime, which has in all probability been applied to it in the shape of slaked lime, chalk, or marl. Periodical liming appears to be requisite to keep this soil in a productive condition, since naturally the land is poor in lime.

There is but one other observation which I would make before giving a few instances of soils upon which lime is actually used, but upon which its use cannot be recommended. It is this:—Never depend upon the use of lime alone on light land; the first application or two of lime may produce a marvellous change; but if no other manures are employed at the same time, the land will become sooner exhausted than would have been the case had no lime been used at all.

On the Composition of Soils not benefited by Lime.

Generally it may be stated that all soils containing more than 4 per cent. of lime are not benefited by lime. If a soil, therefore, naturally contains 10 or 20 per cent. of carbonate of lime, we need not wonder that lime does not produce any good effect. It must not be inferred from this observation that I think all soils containing less than 4 per cent. of lime require lime. I am quite aware that this is not the case, and have become acquainted with excellent soils containing only 1½ or 2 per cent. of lime, and which are never limed, and yet maintain their fertility. For all I know, there may be others which, although they contain rather more than 4 per cent. of lime, may still be improved by the use of lime. Experience alone can here be our guide, and, as far as my experience goes, I have found that lime does no good upon soils containing more than 4 per cent. of lime, and that, generally speaking, the application of lime to land need not be renewed if the proportion of lime in the land still amounts to 1½ to 2 per cent. But I have now to give the composition of four soils upon which I believe lime is largely used:—

Composition of Soils from Longsutton (No. I.); *from Mendip* (No. II.); *and two Soils from Street, Glastonbury* (No. III., *a*, *b*).

a. MECHANICAL ANALYSIS.

	No. I.	No. II.	No. III. *a.*	No. III. *b.*
Moisture	6·33	3·28	7·61	4·30
Organic matter and water of combination	7·59	7·16	15·82	5·50
Lime	22·66	20·22	11·95	13·09
Sand	30·70	46·72	21·53	28·66
Clay	32·72	22·62	43·09	48·45
	100·00	100·00	100·00	100·00

b. CHEMICAL ANALYSIS.

	No. I.	No. II.	No. III. *a.*	No. III. *b.*
Moisture	6·33	3·28	7·61	4·30
Organic matter and water of combination	7·59	7·16	15·82	5·50
Oxide of iron and alumina	11·84	7·19	12·81	15·66
Carbonate of lime	22·66	20·22	11·95	13·09
Insoluble silicious matter..	49·65	57·68	50·79	49·95
Magnesia and alkalies	1·93	4·47	1·02	1·50
	100·00	100·00	100·00	100·00

The soils from Mendip and Longsutton, according to the characters of their constituents, are marly loams; the two others stiff calcareous clays.

The Longsutton soil contains many white soft particles of lime, showing that it has been limed at no very remote period. I also readily detected in it grey light-coloured stones, which strongly effervesced with acid, and were evidently limestones, probably lias or inferior oolite limestone.

The soil from Mendip, a red-coloured soil likewise, appeared to have been recently limed, for it is full of white particles and lumps of slaked lime. The stones found in this soil were partly red sandstones, partly greyish crystalline limestones, and a few bits of crystalline calcspar; both the sandstones and the limestones effervesced strongly with acid.

One of the soils from Street, Glastonbury (that marked *a*), is a stiff dark-coloured soil, full of vegetable matter, and containing also small stones and shells, which strongly effervesced with acid.

The second soil from Street, marked *b*, does not contain much organic matter, but a good many small stones, which by their effervescence with acid are proved to be limestones.

Mr. Clark, who sent these soils, observes that the dark-coloured soil is from a pasture that is tert (that is tart or sour), and scours the cattle after Midsummer before frost sets in; the red-coloured soil, on the other hand, produces sound pasture; when cultivated it was formerly extensively limed.

It has been supposed that the deficiency of lime in pasture land was a cause of the production of sour herbage, or herbage that scours cattle. As I have not paid particular attention to this subject, I cannot pretend to say much about it; but this is quite certain, that there is land, as in the case before us, which contains as much as 12 per cent. of lime and yet produces grass that scours cattle. The growth of sour grass and the soil from Street cannot be connected with the proportion of lime it contains. The dark-coloured appearance and the large quantity of organic matter in this soil appears to me to indicate imperfect drainage, and to this circumstance probably the production of sour herbage is due. We have here another instance showing that there may be an excess of organic matter in a soil although it contain much lime.

These four analyses are particularly interesting in showing the utility of examining soils for lime before going to the expense of applying lime to the land, for they present us with no less than four instances in which the money laid out in the purchase of lime has been spent to no good purpose. And this leads me briefly to allude to the mode of ascertaining whether a soil is likely or not to be benefited by lime. Put a small quantity of soil in a tumbler, and pour upon it first a little water and then a good deal of spirits of salt or muriatic acid; if this addition produces a strong effervescence, there is no need of applying lime to the land; if no effervescence is produced, in all probability liming or marling will be useful. However, this simple test cannot always be depended upon, and it is therefore much safer to have the proportion of lime determined in the soil, which at no great expense can be done by any analytical chemist.

On the Application of Shell-sand to some Cornish Soils.

In conclusion, a few remarks on the use of shell-sand in relation to some Cornish soils lately examined by me may not be amiss, since they apply no doubt to many other soils of Cornwall and Devonshire, upon which shell-sand is largely employed as a manure.

It has been stated already that immense quantities of shell-sand are annually used for agricultural purposes on the coast of Cornwall and Devonshire. A great diversity of opinion appears to prevail amongst practical men as to the economy with which sea or shell-sand is used by the farmer. Some allege that the effect of sand on the crops is very marked; others that hardly any effect is seen to follow the application of shell-sand to the land.

There can be no doubt that in some instances shellsand does no good, but at the same time it must be admitted that in the majority of cases shell-sand is a useful manure for most soils resting on the clay-slate or granite formations along the Devonshire and Cornish coast, for these soils are generally very poor in lime. The use of shell-sand, however, like that of many other good things, has been much abused. It is too often forgotten that repeated heavy dressings of sea-sand cannot produce so good effects as the first application, since shell-sand owes its fertilizing qualities almost exclusively to the lime it contains, and it ought to be remembered that no single manuring element can permanently maintain the land in good heart. It is, indeed, plain that the effects which usually follow the first application of sea-sand must cease when the quantity of lime incorporated uniformly with the surface-soil is so large that the spongeoles of the roots can readily find more than sufficient lime to meet all the requirements of the growing plant.

The examination of some soils from the neighbourhood of Bude has furnished to me, I think, decided proofs that there are many soils in Cornwall which are much benefited by a dressing with shell-sand, and also that shell-sand is often applied to land upon which it is not needed, and upon which money would be far more beneficially spent in the purchase of artificial manures or of artificial food.

The following Table exhibits the composition of five soils from the neighbourhood of Bude. They were sent to me by Mr. Hockin:—

Composition of five Soils from the neighbourhood of Bude, Cornwall.

	No. I.	No. II.	No. III.	No. IV.	No. V.
Moisture	1·68	4·217	..	1·10	..
Organic matter and water of combination	5·87	12·163	7·90	5·77	14·84
Oxides of iron and alumina ..	7·23	7·730	8·75	10·62	7·35
Carbonate of lime	4·23	1·258	11·25	4·87	·95
Magnesia and alkaline salts (determined by loss)..	·05	·282	·98	·27	·47
Insoluble silicious matter ..	80·26	74·350	71·12	77·37	76·39
	100·00	100·000	100·00	100·00	100·00

Soil No. I. came from Newhouse, near Bude, and is an average sample of the clay of the district; depth of soil about 12 inches below yellow clay. This field has not been sanded for the last five years, and as it still contains nearly 5 per cent. of carbonate of lime, a further dressing of sea-sand would be of no use except as a mechanical ameliorator.

Soil No. II. is a soil from a field on Halls. This field has been a furze-brake for the last 30 years, until 1855, and consequently cannot have been sanded for that time. About 30 years ago, Mr. Hockin informs me, it was in wheat and was probably sanded. The soil is light and on a porous rock, in some parts stony; depth of soil from 4 to 8 inches. There is much less carbonate of lime in this soil than in the preceding, and I have no hesitation in saying that a good dressing of shell-sand would now do good to this soil.

No. III. is from a field at Well. This is a light soil, has been most liberally sanded every two or three years for *many* years. Naturally the light soils in this district are almost destitute of lime, and a simple inspection will show that the carbonate of lime shown in the above analysis is all due to the shell-sand added to the land, evidently in enormous quantities, at one time or the other. On land treated like No. III. it may be safely asserted the further application of shell-sand must turn out a complete failure.

No. IV. is a soil from Broomhill Field, Berry Park. This field, I am informed, is a fair specimen of the soil in this district; it rests on a porous rock, and is in a good state of cultivation. Depth of soil about 8 inches; has not been sanded for the last 10 years.

It will be seen that this soil still contains nearly 5 per cent. of carbonate of lime. On this soil likewise a further application of shell-sand would not be attended with any benefit. The analysis of this soil is interesting, inasmuch as it shows that shell-sand may remain for a long time in the soil, and that therefore good dressings with shell-sand need not be repeated at short intervals.

The last-mentioned soil is from a pasture meadow which 50 years ago obtained a prize as an irrigated meadow. The quantity of lime in this soil, taken at a depth of 5 inches from the surface, is small. Probably the surface-soil contains more.

These instances, referring to the use of shell-sand in Cornwall, I think are instructive. They explain why in some cases no effect whatever is produced by the use of shell-sand, whilst in others even a moderate dressing benefits the crop to which it is applied; and why sometimes shell-sand only produces a good result when it is used in very large quantities, in which case it acts mechanically, and not chemically, upon the soil. In short, the same principles which regulate the application of lime to the soil ought also to guide the farmer in using shell-sand. How far practical men act upon principle it is not for me to decide, but this is quite certain, that instances in which much money is periodically wasted in the purchase and application of lime, marl, or shell-sand, are far more numerous than is generally believed.

XII.—*On Water Meadows as suitable for Wales and other Mountain Districts.* By T. BARKER, Pusey.

THE following account of the most improved Devonshire system of water meadows, which has now had some years' trial, has been drawn at my request.

During a short holiday which I spent last year in the district of the Westmoreland lakes, I observed that there was a considerable extent of land which appeared suitable for irrigation. I conversed on the subject with several of the "Statesmen" and farmers in that most interesting district. Of course I had to overcome the primâ facie presumption against an amateur traveller knowing anything practically of farming; but partly owing to the common instinct which leads hill-countrymen to find each other out, partly owing to the lesson taught by Mr. Pusey, always to learn from farmers before presuming to teach them, we soon found ourselves on common ground. And, having met with one farmer who often wished he could get the wash of his midden over his paddock, and another (a winner of prizes for Herdwick sheep), who had dug a gutter from his courtyard into his field, and who not knowing what to do next had made divers sallies at random with his plough coulter, I thought some good service might be done by printing a short account of the West-country system of irrigation and distributing it in the North.

It seemed also not unlikely that the subject would be interesting to our hospitable friends in South Wales, and therefore a suitable introduction to our meeting at Cardiff.

Very possibly, in a district where so much enterprise has been exhibited, some landowner may be disposed to reprint and circulate the article among his neighbours.*

The article is written by the son of the agent of one of the largest properties in a mountainous district, who therefore has had opportunities of judging how far it is suitable to the wants of those among whom he was bred. He has had a good education at Cirencester College, and has had the still less common advantage of managing a farm and an estate under Mr. Pusey, and of witnessing the introduction of the system, which he describes, into a district where it was before unknown.

I have done my best to revise the paper carefully, and to see that as far as I am able to judge it accords with practical experience.

As an Introduction to Mr. Barker's account of the new system of irrigation, it may be well to state that there are two other systems used in the West of England, and one, highly artificial, which prevails in Hants and Wilts.

Of the last I do not propose to speak here, beyond saying that it is enormously expensive, because it involves laying up the whole surface in longitudinal ridges like asparagus beds, at a cost which cannot be estimated at less than 15*l.* per acre: it also, as practised in the counties referred to, requires great quantities of water, such as rivers alone can supply. Possibly this may be adapted to wide valleys in a flat country; but the Devonshire systems have been worked out by experience on the hill side, and extended to the alluvium at the foot of the hill.

The *primitive* form of Devonshire irrigation is one best known by the name of the *catch-meadow;* it is perfectly simple, and applicable to the steepest hill-side. Hay is made in many a catch-meadow, where no cart on wheels can pass to carry it; it is all drawn off either by hand on drays and slides, or on the back of the packhorse. The catch-meadow is watered by a series of horizontal or nearly horizontal gutters, one below another, at a distance of from 20 to 40 feet. At the highest point at which good water can be found in what we call a combe (or sloping gorge), or to which it can be brought, after being collected from springs oozing out from the foot of a rock, a nearly level gutter is traced along the hill-side; if it is carried for any great length, then at certain intervals a sudden turn downwards for a foot is given to it, throwing the gutter into the form of a crank. The object of this drop in the level is to ensure the onward movement of the stream, which might otherwise soak away before it reached the farther end of the gutter. When the meadow is being watered, a stop, consisting of a square sod of turf, is placed in the gutter to fill it up completely, and cause all the water to overflow the gutter along the line behind the stop; sometimes also several stops are placed in a sloping position at intervals, so as not to intercept, but only to retard, the passage of the water: the irrigation then takes place gently along the whole line of the gutter, the water standing or rather moving slowly and overflowing at different levels between every two stops. Another gutter, and another, and so on, to the bottom of the hill, is laid exactly on the same system. Each catches the water from the gutter above, and re-distributes it; the object of the succession of gutters being merely to correct the invariable tendency of water to find out the lowest ground and to run in separate little channels. If the ground immediately below the highest gutter gets more than its share, the water is turned in at a lower point, and pursues the same horizontal course at a lower level. Nothing can be more simple. Thousands of acres on the hill-sides of North Devon, once mere furze-brakes, are now valuable grass-land, owing to this watering, never having received a load of manure within the memory of man. The recent formation of similar meadows is to be seen in great perfection on the heights of Exmoor, at the farm of Mr. Robert Smith, who is known by reputation to every reader of this Journal. Land literally worth nothing—certainly not worth 2*s.* 6*d.* an acre in its natural state ten years ago—is now valuable grass-land. If I remember right, Mr. Smith informed me that the summer grass of 20 acres so treated had been let for 50*l.* Mr. Smith has effected this without a cart ever being led on the land, by the judicious use of the large horizontal gutters above described, which have been made to carry down the washings of the hill, and so do the work of the cart by carrying earthy matter where it is required. Mr. Smith considers this plan especially suited to mountain districts. It should be noted that for the purpose of washing down soil the gutters must have a considerable size and a considerable fall.

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* The type will be kept standing for a short time after the publication of the Journal.

The *second* system is more difficult to describe. It is found on the alluvial soils at the foot of hills. And, in proportion as the swampy ground in the lower valleys has gradually been underdrained, it has found its way into some of the best arable farms in the West of England. A very perfect specimen was exhibited (on the occasion of the Exeter Meeting of the Royal Agricultural Society) on the farm of Mr. Joseph Gould, at Killerton, near Exeter; and similar meadows have been lately laid out on the adjoining estate of Lord Poltimore.

It is almost impossible to give in words a detailed description of the system of these meadows, for every field has its own system, so much depends on circumstances, and must be left to the judgment of the gutterer. But there is one principle on which the whole depends, namely, this, that water will find out the lowest ground. In old times gutterers began by turning the water over the highest spots, and covered them first, and considered where to take the water next. But now, observing well that the water finds out all the hollows, some of the main carriages for the supply of water are placed in the valley, and not on the hill; and then, beginning with the highest point at which water can be obtained, it is gently coaxed out of the hollow on to the next swelling or projecting ground, whence it falls to the nearest low ground it can find, and then the process is repeated.

Some such arrangement as this is necessary to cover a field on which the general fall is slight: such ground, being generally alluvial, will also be uneven, because when it was in a state of nature the water in times of flood would have worn out its channels, leaving a sediment on other spots, where it rested for a time; in some places also the vegetation would accumulate and raise the ground: these risings and fallings constitute the difficulty of irrigation, and test the skill of the gutterer. No precise rules can be given for laying out a meadow on the system usually practised on such land, beyond the general principle, "lead the water out of every hollow by a surface gutter with a slight fall, and as soon as the general level of the field has dropped sufficiently to give you command of a lower piece of ground begin watering again." This plan, it will be observed, is in fact a modification of the catch-meadow before described. The same gutter first receives water from the land above, and then delivers it to the land below; the modification being that it does not receive and deliver at the same point; it begins to receive in a hollow, it runs on a little farther, and then, finding itself on salient ground, begins to deliver; but throughout the whole course the water in the gutters must run almost horizontally, and as a natural consequence it is liable to be easily checked even by blades of grass and leaves, to move sluggishly, and in passing over porous ground to soak away by filtration.

The peculiar merit of Mr. Bickford's system, about to be described, is that the onward motion of the water and the supply of the irrigating gutters is not dependent on horizontal conduits, but that a more rapid and certain method is provided for keeping the delivery gutters or "irrigators" full at any point at which they may be required to act.

It may conduce to clearness to define the meanings of some of the terms used (see also plans I. II., opposite page 282):—

Carriers or carriage-gutters carry the main stream or a portion of it to some point from which the distribution commences. These gutters generally have a considerable inclination.

Irrigators or serving-gutters are generally quite level, or nearly so. Their office is to overflow and spread the water evenly over the land.

Feeders or transverse gutters. Their office is to keep the *irrigators* full, drawing their supply from the *carrier.* They generally run in the line of the *greatest fall of the land;* but in running on the top of a *ridge* on level ground they often act as *irrigators* on both sides of the ridge.

Outlets, driers, or drawing-off gutters. Their office is to collect the water as soon as it has passed over the grass, and to take it away quickly. These gutters are always in low ground relatively, and have the greatest fall attainable at the point where they are situated. They sometimes, as they proceed, become *feeders,* and sometimes *irrigators,* or even serve to fill a *carrier* for another field.

T. D. ACLAND, Jun.

SIR, Pusey, March, 1858.

In accordance with your request, I beg to forward you a short account of my experience in the formation of "Water Meadows," and of the beneficial results which I have seen produced by them in a district in which they have been introduced within the last ten years.

To have grass early in the spring, or at the time when swedes or turnips are (or ought to be) consumed, and before vetches and other spring food are ready, is well known by all sheep breeders to be of the greatest possible value. If then food of the above description is so much required at this particular season of the year, the question naturally arises, are there the means of procuring it, and if so, what are those means? Any one who has been in the neighbourhood of "water meadows" will have seen the ewes with their lambs, feeding on fine verdant grass just at this period, when all the fields around *not watered* are brown and bare. But then you will be told that all farms cannot have water meadows, either because they have no water, or because the water cannot be brought over the land; this is very true of many farms, but in most hilly districts there are streams, springs, or drainage water, which could be easily rendered available for the purpose of irrigation, and made to produce grass, I may almost say, months before the meadows would have had any keep on them had they not been watered.

Before I explain the formation of water meadows I may perhaps be allowed to state, as a proof of what I have said, that I heard a farmer, who had not till lately been used to water meadows, on the occurrence of some dispute about the water he had ponded back for irrigating his meadow, say that he would rather give 50*l.* per year more (the meadow measured 50 acres) than he would be deprived of the use of the water.*

"Water meadows" are now laid out on a less expensive principle than that which prevails in Wiltshire, Hampshire, and other parts of the South of England, as distinguished from Devonshire and the West of England generally. The new or improved Devonshire system was invented by Mr. Bickford, and described six years ago in the Journal of the Royal Agricultural Society, vol. xiii. It has several advantages over the Hampshire method, according as the ground was formed into beds, and wooden sluices were placed along the carriers at an expense of from 15*l.* to 20*l.* per acre. The cost, a most important item, is considerably reduced, as I hope to show presently. This of itself ought to be a great inducement to the further extension of water meadows; secondly, the same quantity of water will cover a much greater surface; thirdly, the water is more rapidly and easily distributed over the land; and fourthly, the gutters, owing to their dimensions, occupy very little of the ground, and cause little or no obstruction to the passage of carts during haymaking.

The Main Carrier.

In commencing the construction of a water meadow a carriage gutter is cut along the line of the highest ground. This main gutter is for the purpose of taking the water from the brook, or other source from which it may be derived, in order to feed the smaller or irrigating gutters—in fact it acts the part of a main artery. This main gutter need not be laid out by the level. A rapid inclination should be given to it, according to the nature of the ground, and the quantity of water which can be made available. Where it can be had, a fall of 2 inches in a chain is convenient, but if need be a less rapid fall will answer the purpose. The width of the main carriage gutter should be about 18 inches, and the depth from 6 inches to 1 foot. The dimensions must, however, in some measure be regulated by the quantity of water to be conveyed along it; the gutter diminishes in size as it approaches its termination, so that at last it runs out to nothing.

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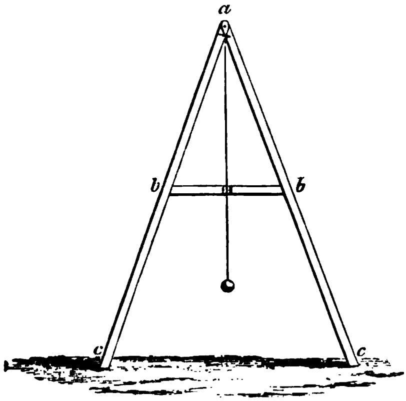
* There are many instances in the north of Devon where the watered land lets for from 30*s.* to 50*s.* per acre more than the adjacent grass lands which have not the use of water.—R. S.

Immediately below the carrier should be cut a set of small tapering gutters. (See lithographed Plan, No. I., opposite page 282.) The office of these tapering gutters is very important, as they secure the even apportionment of the water over different sections of the field, adjusting the supply in the way of a self-acting valve. Sometimes the end of a carrier itself performs this office, and is tapered accordingly. (See Plan II.)

The Small Irrigators.

A series of smaller gutters are cut below the main carrier (at different levels), in the same general direction in order to catch the water as it overflows from the carriage gutter through the small taper gutters. The distance between these gutters greatly depends on the shape of the ground, where it is undulating and uneven more are required. These small gutters ought to be laid out quite level. I say quite level, subject however to a qualification to be named hereafter. The water as it flows over the land is collected in these small gutters, and as they are practically level they again distribute the water evenly over the surface, when they become filled; were it not for these small gutters the water would get into little streams and flow down along the hollows, instead of the ground being all equally covered, especially where the land has never been ploughed or levelled.

I mentioned that the small gutters ought to be level, this however in practice must not be carried out with mathematical correctness; in crossing any hollows the gutter should be kept rather higher, say an inch on 33 feet run, or the water will gather in the hollow and overflow too fast at these points. On passing along the projecting ground on the other hand the same difference should be made in the contrary direction, viz., an inch lower than the strict level, in order that that portion of the ground may receive its due share of the water. The exact rise or fall to be given can only be arrived at by experience. Any surplus sods which are taken out of the carriers, &c., as well as any turf produced by the removal of banks or heaps, should be placed in the largest holes and hollows, in order to make the surface more level; the sods should be trodden in, and if the water is not turned on injudiciously they will soon bind together with the the old turf. It is of great importance that the water should never be stagnant on any portion of the land, otherwise rushes and coarse grasses will grow as they would do in the vicinity of springs and on wet undrained ground; an outlet gutter should be carried out of any such hollow (if filling it up would be too expensive) to the nearest level gutter below it. Care should be taken never to allow the water to remain very long in the same place, I have noticed that the grass is apt to turn white, this is a clear sign that something is wrong. The water should never stand still and never be so deep that the tops of the grass cannot be seen above it. In fact, it is the sign of perfection of irrigation, if you walk into a meadow under water, and find out the fact by wetting your feet before you see the water.



The level serving gutters are marked out by means of a very simple instrument, much more convenient than the spirit level. It is in the form of the letter A, and stands about 5 feet high, the feet at the bottom being about 4 feet apart. A plumb-line is suspended from the apex *a*, and a notch is made in the centre of the cross piece *b b*, so that when the two feet *c c* stand upon the same level, the plumb-line crosses the notch. The gutterer rests one of the feet of the instrument on the ground, and using this as a pivot, turns the whole round like a pair of compasses, till he finds by the plumb-line crossing the notch that the two feet stand even: then a boy following cuts out a small sod as a mark where the first foot stood; the man then uses the second foot as the pivot, turns the instrument round again until he finds the next level spot in the same manner, and so proceeds to trace out a level but frequently meandering line. Making, as I have before said, a small allowance in crossing the hollows and along the projections. Each place where the pivot rests is marked by cutting out a small sod. At points where the ground changes so as to render it impossible to get a level, a stop is put in the gutter, and a fresh level taken for its continuation. The width of these level gutters is 5 inches at the outside, the depth about 2½ inches. It is sometimes[*] convenient to make a drop in a gutter, so that the gutter, by means of a rapid fall, may more quickly empty itself when required, preserving its level direction for irrigation.

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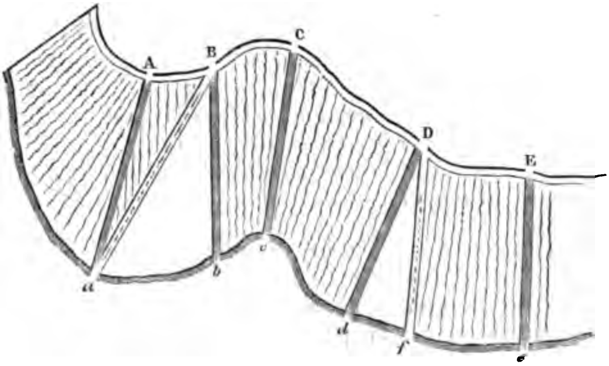
[*] Not often needed on Bickford's plan. See p. 269.—T. D. A.

Outlets, Driers, or Drawing-off Gutters.

It is of quite as much importance to get the water off quickly as it is to get it on evenly. To effect this gutters are cut in the direction of the inclination of the ground, *i. e.* in the exact same line along which the water would flow if left to itself to run; if the gutters take any other direction, swerving too much to the right or the left, they will cut off the water from some of the land on one side or the other. The lines A *a*, B *b*, C *c*, D *d*, E *e*, are placed right, whereas B *a*, D *f* are cut across the line of flow, and leave a portion of the grass unwatered in consequence.



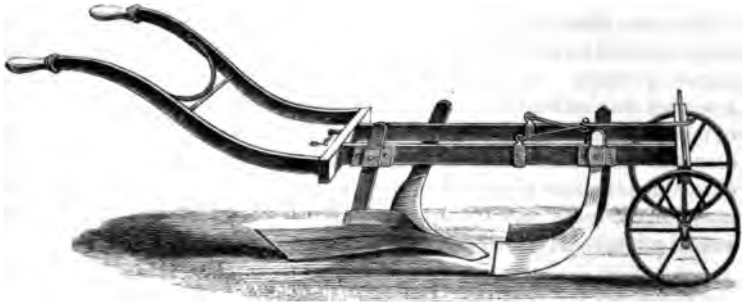
When the land is being irrigated, these downward gutters have stops placed in them where they cross the level or watering gutters; stops are also placed along the level gutters when required to confine the water to a particular width of land; the number of these depend on the quantity of water, when the supply of water is short more are needed; it is easily seen on walking over the meadow when the water is on, where they are required, nor does it give any trouble to place a piece of sod across the small gutter—it is done in a moment.

The Drying Gutters also act as Feeders.

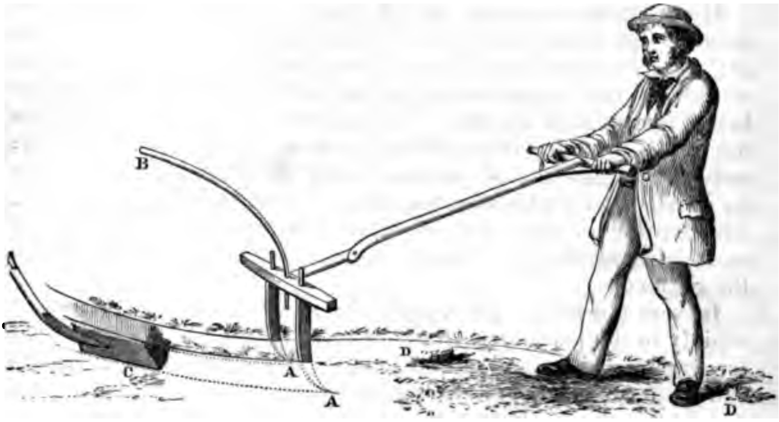
The downward gutters also serve the purpose of feeders. Were it not for these transverse feeding gutters the land nearest the carriage gutter would always have the first water, and thus receive the greatest benefit, and the lowest portion of the field would come the worst off. In order to obviate this the feeders or transverse gutters are cut, from the carriage gutter at the top, across all the level gutters to the lowest. By placing stops in the proper places the water can be conveyed directly from the carrier to any of the catch gutters, without passing on the intervening land, so that the lowest part of the field can be watered first if thought desirable. If the arrangement of the meadows in the lithographed Plans I. II. be studied, it will be seen that the whole supply of water may be confined between any two of the downward lines, and the irrigation may be made to commence at any one of the level lines marked 1, 2, 3. The difficulty usually experienced, but entirely removed by Mr. Bickford's system, is to do justice to the lowest corner; for among other reasons, the sheep always lie on the highest and driest ground; so the upper part of the field takes care of itself.

The level gutters being marked out by means of the A level, are easily and rapidly cut with a plough made for the purpose, which can be obtained on application to Mr. Bickford, Crediton, Devon (the inventor of the system above described). One form of this plough contracts and expands, by means of apparatus for the purpose, to any size required, cutting the tapering shaped and other gutters with precision. There is another form, not expanding, and cheaper to purchase, cutting the small gutters only. This implement is not influenced by the swerving of the horse (noticed in p. 277), but is completely under the control of the workman.

The plough, by having a separate set of coulters to fix upon it, can be used as a horse-hoe during the turnip season, or an ordinary horse-hoe may be made with a very little contrivance to do the work of the gutter plough. On small occupations, or where the gutters must be very crooked, the kind of implement you were naming to me, as used by yourself in cutting out your own meadows, is well worthy of notice. I understand that it consists merely of a cross-beam attached to a handle like that of a breast plough, with two knives or coulters fixed in the beam. A man holding the bar of the handle at the opposite end to the cross-beam, in which the coulters are fixed, draws the tool backwards, employing a boy (if necessary when the ground is hard) to press upon a stick placed like the stilt of a plough, in order as the men say to keep the knives in their work, the sides of the gutter having been thus cut to the width and depth required, the



man afterwards shovels out the gutter to its proper depth, with a Devonshire bent-handled shovel about 4 inches wide. The expense of a tool such as that which has been described is very trifling, and where the land is uneven and the gutters consequently very twisting, the gutters can be cut more truly by manual labour, for the man keeps exactly in the right track, whereas a horse in making sharp turns, sometimes rather swerves, and thus pulls the plough out of the right line.



In first laying out a water meadow it is of course preferable to employ an experienced gutterer, for although the level catch gutters can be laid out with mechanical accuracy by means of the A level, yet there is room for the exercise of much judgment in order to give the best direction both to them and to the feeding gutters. An experienced eye, moreover, will save a great deal of time, and is of great service in making the most both of the water and of the land. The meadows once laid out are easily kept in order afterwards.

Cleaning out of Gutters.

Gutters cut on the old system require to be cleaned out every year just before the watering season, and this for two reasons. First, because they become choked up with rank grass and hinder the free flow of the water in a horizontal direction, which flow is essential to the success of the level or nearly level carriage and level feeding gutters. Secondly, because the sides of the gutters are trampled down by the live stock all through the summer; thereby spoiling the even edge of the gutter, and rendering the distribution of water irregular.

In order to put the old gutters into a good state a man is employed to clean them out and trim them up, at an expense of about 2*s*. 6*d*. per acre. The man so employed leaves a heap of refuse at about every twenty paces, and these heaps have to be removed before the meadow is laid up for hay. The gutters consequently become wider every year, till at last the width is so inconvenient that they have to be filled up at great expense and relaid.

If the system explained in this paper be adopted, it is recommended that fresh gutters should be cut every year: there is no difficulty in doing this, it is only necessary to follow the line indicated by the original ones, cutting one year above and another below the original gutter. The expense of cutting the gutters out afresh is very trifling, about 1*s*. or at most 2*s*. per acre; the sods which come out of the new furrow are placed in the old one by its side and trodden in, and thus all the ground is made good. The cutting of new gutters every year has the advantage of entirely preventing the growth of coarse grasses and weeds along the gutters.

In very porous or peaty soils the water is apt to sink away rapidly in the main carriages; on such land it is advisable to cut the carriers wider and not so deep. If clay or road scrapings can be procured within an easy distance, I should recommend a thin coating being put along the main carriers. I have known instances of its being done with great advantage.

The Quality of Water.

Before laying out meadows for the purpose of being irrigated there are several important questions which ought to be taken into consideration. A proper supply of water is of course the first and most essential point, and even if this can be had it must not be taken for granted that all waters will have a beneficial effect when used for the purpose of irrigation. It is found that water flowing from the surface of "wet peaty" or "black moory" soils is positively injurious; water also which contains large quantities of iron is hurtful.* But streams in which water-cress flourishes, and those containing mossy stones, are for the most part good for irrigation. Water which flows from springs, such as are never found to freeze, are almost invariably well suited for irrigation; in fact water from those which are termed "warm springs" in most cases produces the earliest grass. I presume this is owing in a great measure to the temperature of the water being higher than ordinary water, and thus keeping the ground warmer. Drainage and ditch water should be conveyed unto the meadows if possible. Water, especially after heavy rains, in passing down to the drains, not unfrequently takes along with it some of the manuring substances contained in the soil: if then this water is allowed to escape, these manuring matters are wasted, but when it is used for irrigating any meadows below, these valuable ingredients are again deposited, so that what is lost in one field is gained in the other.

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* This kind of water should be ponded before it is used.—R. S.

In mountainous districts much of the water which forms bogs at the foot of hills and the head of valleys may be turned to account. If a deep drain can be run up into the subsoil, the bog may be tapped, and some excellent water may generally be drawn off before it has become contaminated by the peat. In fact, the cases in which underground draining fails to yield useful water for irrigation may be regarded as exceptional.

Time for Watering.

It is a good plan to commence watering the meadows early in the season—not later than the beginning of November.* From this period up till February the water should, as a general rule, be kept on about six days and off three days. This of course will partly depend on circumstances, such as the supply of water, weather, &c. In frosty weather the water should not be removed from that portion of the meadow on which it was at the time the frost set in, it should if possible be kept gently moving, and as long as it does so the shallower it is the better. If the ground becomes covered with a sheet of ice the water may then be turned off. After February the meadows require rather more attention, and the water should be more frequently removed as the weather gets warmer. Care should be taken not to allow the grass to get a white scum upon it, for if this is not prevented serious mischief is done, the grass, instead of improving, will grow less. In hot weather the water ought to be changed every day.

The land selected for a meadow should either be naturally dry, or made so by draining. If the latter plan has to be resorted to, the drains should be cut deep, otherwise the water will soak into them too quickly; and the water must not be laid on the same year as that in which the draining is done.

Where practicable, as is the case on farms where the meadows are situated below the farm premises, it is a good plan to bring the water along by the farm steading, in order to catch any washings from the yards, and thereby to enrich the quality of the water used for irrigation. These washings, or liquid manure, are often, even at this improved period of agriculture, allowed to run to waste, whereas they might be made to put money in the farmers' pockets, by producing early and plentiful crops of grass. The water in brooks after heavy rains is generally thick and muddy, this is chiefly owing to the washings of the land above, and as there is generally a considerable value in the finely divided particles of mineral matter thus held in suspension, the opportunity should not be lost for giving the meadows the benefit of it.*

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* In the West from October to March.—ED.

The first crop of grass in water meadows is generally fed off, the meadows should then be carefully looked over and the water turned on again. As the weather becomes warmer, the water, as I have before stated, should be kept on for shorter periods. The second crop is mown in most cases, as it is found dangerous, at least for sheep, to water and feed again, especially if the weather is warm, owing to that fatal disease called rot being apt to be produced amongst them. The two great advantages of water meadows are that they produce a large quantity of early food in the spring, which is so valuable for ewes and lambs, and that they yield heavy crops of hay after the first crop of grass has been eaten off, and this, *mark*, without any manure being applied.

The cost, a most important question, according to the present system of laying out water meadows, is very moderate. The late Mr. Pusey, whose name is familiar to every agriculturist, and who was always amongst the first to improve his estate and confer a benefit upon his tenants, had a large quantity of grass land converted into water meadows; the cost, including every expense, with hatches across the brook, did not exceed 2*l.* per acre.† In many places the cost would be little more than half as much. I think, therefore, looking at the small outlay, and the great advantages to be derived, that landlords and tenants ought to look well around them, and let no opportunity escape where such a system can be carried into effect.

The Application of the System to Mountain Districts.

In recommending the system of irrigation to the agriculturists of the Principality of Wales and of the mountain districts in the north-west of England, I do not lose sight of the difficulties they may have in some measure to contend with. I know the mountain sheep are kept during the winter months in the low lands and meadows, and are very active in getting over and through the fences, still I feel confident that the advantages of having a little water meadow would soon be found to more than fully compensate the farmer for keeping such fences around them, as it would defy even the "active Herdwicks" to penetrate. It is the custom on several farms to rear a large quantity of stock, and the farmers perhaps consider it a long time to keep their meadows unstocked from November to March, still I think some of the meadows most adapted for irrigating might easily be kept clear during the few winter months, without the farmers in any way reducing the number of their stock, more especially when they consider the comparatively early period at which they will have grass in the spring, and the greater bulk of hay they will be able to cut from the same ground—*one mouthful* of grass in the spring is worth *two* in the autumn. The way is to begin with a little at first, and if that is found to answer then to make further progress. I certainly should not advocate the laying out of more ground than there is water to do well. I know some meadows that were laid out for the purpose of being irrigated, three or four years ago, and have not been able to be watered more than half a dozen times during the whole of that period. Water meadows, from such occurrences, traceable though they be to want of judgment, are apt to be condemned by some people, whereas had there been a good supply of water the results would have been very different.

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* In support of this statement I may refer to a meadow on my own farm. It was made in 1850 upon the rugged mountain slope, then next to worthless, overrun with natural weeds; it has since received the washings of the upper land, and a quantity of peat soil washed on to it by the water carriers: it is now worth 50*s.* per acre as meadow land.—R. S.

† Mr. Pusey's meadows on Goosey farm were laid down by Mr. Bickford himself; the cost was less than 2*l.* per acre.

As water meadows are earlier and better where well sheltered, I should recommend in exposed situations the planting of belts of wood with serpentine fences in different parts of the farm; they will both shelter the land and be a great comfort to stock in inclement weather, they also give the country a picturesque appearance.

In conclusion, I beg to say, that after the meadows are laid out, the gutters cut, and all matters connected with them completed, they will not do to be left to themselves; a watchful eye must overlook the carrying out of every detail belonging to them. It will, however, have been made evident by the foregoing remarks, that it does not require much capital to lay out a water meadow, nor much time or skill to look after it, so that no one need be afraid of having them on that account; while few investments of money or time in agricultural matters are so certain to yield a return with profit.

I am, Sir, your obedient Servant,

T. D. Acland, Esq. THOMAS H. BARKER.

The two plans annexed are intended to illustrate the application of the system described by Mr. Barker. 1st, to the hill-side; 2nd, to difficult level ground, such as may be found by the river side or on the delta formed at the head of a lake. Both are taken from real fields, modified for the sake of illustrating the subject. No. I. is taken from a field of my own, which I laid out with my gardener five years ago, after reading Mr. Bickford's article in the Royal Agricultural Journal. No. II. is taken from the field belonging to Mr. Clarke, referred to in the letter of his bailiff, Mr. Midlane, who is a thoroughly practical man and a good farmer (see page 283).

No. I. This meadow lies between two little rivulets. That on the left-hand, to the north, is good water, improved by the sewage of a house and stableyard; that on the right hand is poor cold water, issuing from an alder-bed and bog. If the latter stream be traced on the plan, it will be seen that it is not used for watering, but carried under the left-hand stream, which crosses in a trunk at T; the bog-water goes down to a pond, when, after exposure to the air, it becomes improved, and fit for irrigation at a lower level. The left-hand stream is conveyed from north to south in a gutter (A B) with a rapid fall; it is confined on the north side by the gutter (A C) in the hollow on the south side by a special channel (C D) to keep it out of the bog-stream.

At the point D is the mouth of the main outfall of some underground drains, indicated by dotted lines. At E is a similar outlet; all these streams are combined and carried over the trunk T, to begin their work again in a new meadow to the south-west and south below the wood. On the north side the stream may be led away to a projecting knoll, which swells to the north-west, and flanks the valley; these undulations fairly represent the configuration of a mountainous country. It is easy to see what perfect mastery over the water is thus obtained, how completely it can be concentrated on any particular section, and how quickly and directly it can be conveyed to the desired point; and this may be all done by following the undulations of the land without levelling the surface.

No. II. represents a field on a river side, alluvial deposit, with a very slight fall, and yet with several channels cut by floods in old times, rendering communication between points at the same level somewhat difficult. To begin with—the stream entering at the point A is carried for some way up stream in the direction A B, in order to gain command over knoll B C D.* The stream

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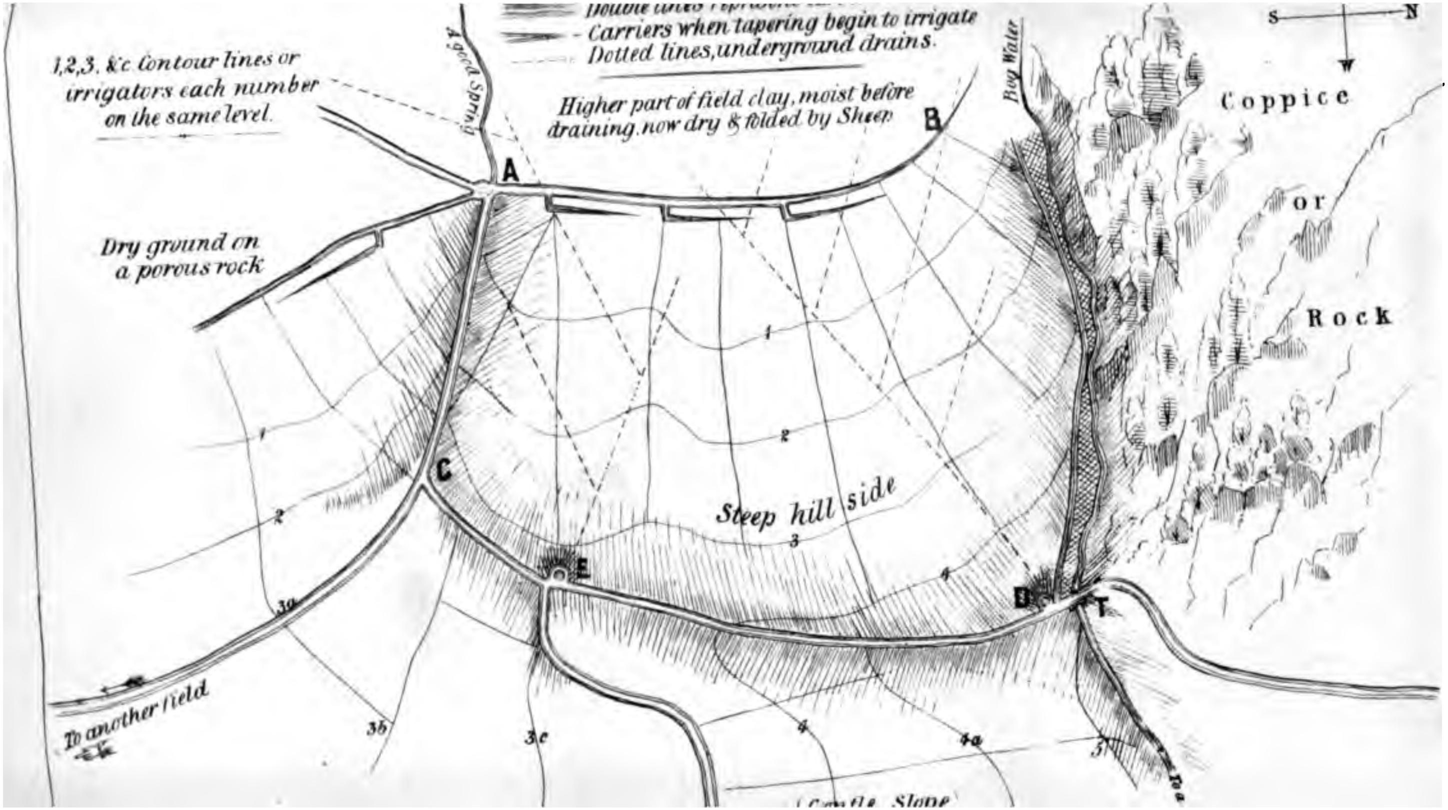
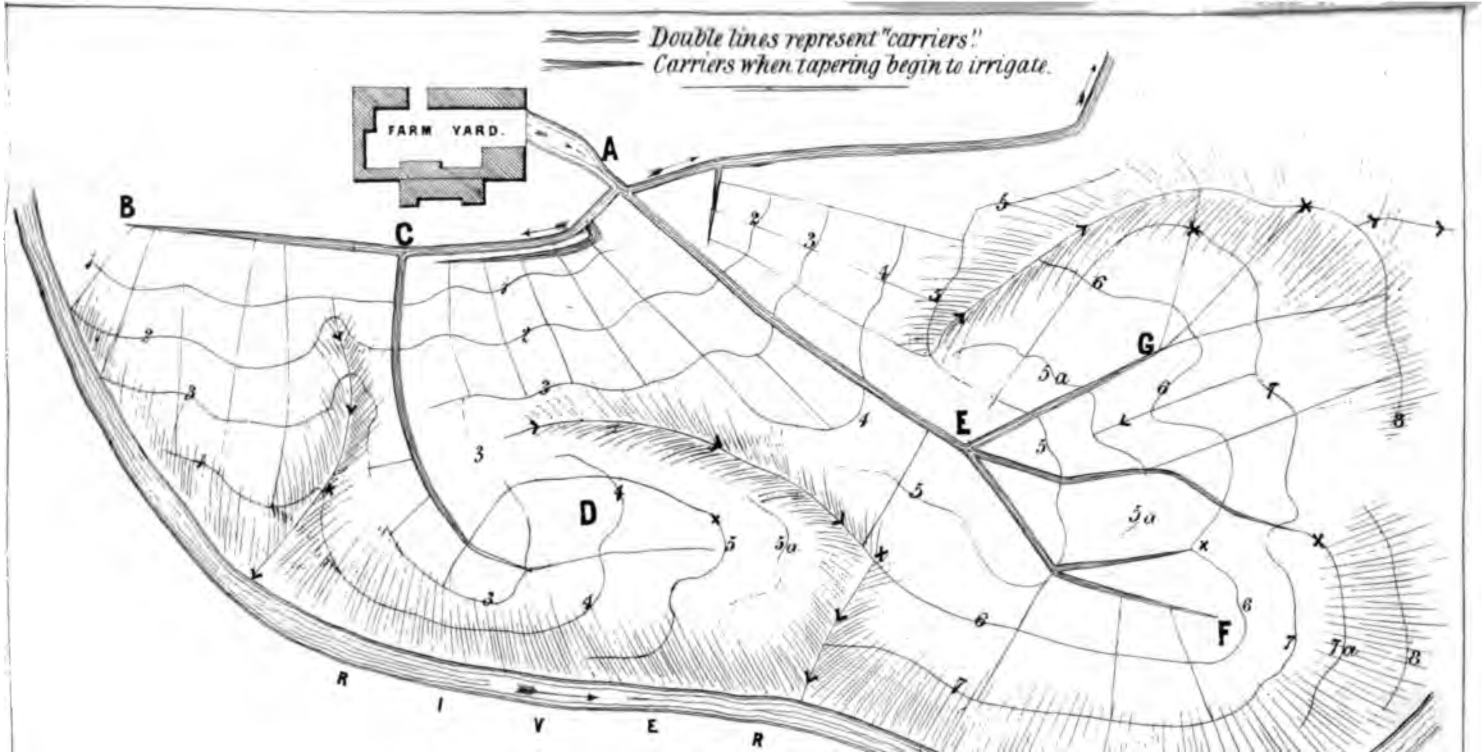
* This device of going up stream is sometimes practised on a large scale, in order to lead a warm, rich stream from a lateral valley over a river-side meadow, when the use of the river-water would be comparatively unprofitable. For this purpose an embankment is thrown up against the bank of the river, to carry the supply upwards to the head of the meadow; the outlet waters after irrigation pass under the embankment in culverts. This arrangement may be noticed on a fine meadow between Tiverton and Dulverton, on the banks of the Exe, a little way above the Exeter Inn.


Double lines represent
- Carriers when tapering begin to irrigate
Dotted lines, underground drains.
1,2,3. &c Contour lines or irrigators each number on the same level.
A good Spring
Higher part of field clay, moist before draining, now dry & folded by Sheep
Bog Water
S
N
W
Coppice or Rock
A
B
C
D
E
T
Dry ground on a porous rock
Steep hill side
1
2
3
4
3a
3b
3c
4a
5
To another field
To a
Gentle Slope


Double lines represent "carriers."
Carriers when tapering begin to irrigate.
FARM YARD.
A
B
C
D
E
F
G
RIVER
5a
7a
8

is distributed in the ordinary way over the general slopes, &c., and is again separately led out to the point E. In order that it may radiate over the projecting elevation, marked E F G, each of the radiating carriers (it will be noticed) gradually tapers, in order that as the stream advances, finding less capacity in the channel, it may overflow to the right and the left. The course of the emptying or drying gutters in the hollow is marked >, and at certain points marked × : sometimes a transverse supply gutter, sometimes an emptying gutter becomes so completely level that it is merged in the system of level contours and becomes an irrigator. T. D. A., jun.

Bishop's Barton, Ashbrittle, 18*th May*, 1858.

DEAR SIR,—Agreeably to your wishes, I am happy to forward you a brief account of the success we have experienced in carrying out Mr. Bickford's system of irrigation. Although this is now only the third year we have pursued the plan, the improvement both as to quantity and quality in the production is truly surprising. Our meadows, originally of barely third-class description, are now become so much improved, that we have turned out some exceedingly creditable and well-fed animals, entirely grazed on hay and roots, without the assistance of cake or corn. Having likewise the advantage of an early bite of grass for the ewes and lambs, we are enabled to keep an additional amount of stock, which consequently increases the annual value at least 20*s*. per acre.

I should strongly recommend the occupier of any coarse, rough meadow-land (with a stream of water available and suitable for irrigating purposes), to deeply drain and lay it out according to this system. I am convinced the benefit arising would be such as to repay the whole outlay in three years; and the land, with a little attention at the proper season, become a permanent benefit to the farm.

Many men were much prejudiced against the system at first, from the gutters being made so narrow and shallow that sufficient water could not be carried on to be of any service, and it was with difficulty they could be persuaded that damping was more beneficial to the growth of grass than washing. They now find where the water barely trickles the most luxuriant grass is found, and where any one has been bold enough to make trial, I see the gutter-plough at work the succeeding autumn. This dry summer has clearly proved the superiority of Mr. Bickford's plan over the old large gutters.

I can from experience, and without fear of contradiction, pronounce the system, if properly carried out, to be the most economical in practice,—1st, as regards the very small quantity of land cut for the gutters ; 2nd, the trifling stream necessary for a large meadow ; and, lastly, the great saving of time and labour. In conclusion, I am quite sure a trial is only necessary to convince the most sceptical that the system is perfect.

I beg to remain, dear Sir,
Your obedient servant,
GEORGE MIDLANE,
T. D. Acland, Esq. Farm-Bailiff to E. T. Clarke, Esq.

The following extracts are taken from communications furnished by Mr. Edward Ellis, whose system of laying out water-meadows is substantially the same as Mr. Bickford's. Mr. Ellis was at one time employed by Mr. Pusey, and has had some practice in Wales ; but I must leave him to tell his own tale :—

"The gutters of very many of our meadows and marshes are got into a very wasteful and impracticable state, their width and depth being increased more than double the intended size from the fact of their having been made perhaps fifty years, and some of them even longer, and from an annual clearing, oftentimes causing heaps by the edge of the gutters and requiring to be carted away,—a practice highly discommendable, as their sides become sloped and thrown out of level, and their size necessarily increases. Thus a great waste of land is occasioned, and an extra quantity of water retained in the gutters to soak away through the subsoil and evaporate in the atmosphere after the water is shut off from the meadow ; their margins also are covered with coarse grasses and sedges, instead of a luxuriant herbage.

"That thousands of acres of meadow and marsh land have these disadvantages cannot but be admitted, but the expense of recutting, though really trifling, is considered by many too great to repay the outlay. It is often supposed to be a matter of some difficulty to procure sufficient soil in the same meadow, or within a reasonable distance from it, to fill the existing gutters ; but I have almost invariably found that this apparent difficulty is easily overcome by slightly widening and deepening the ditches around the meadow, and by lowering a high place or two, which may be found in nearly every meadow. This should be done by first removing the turf and surface-mould, then carting the soil away to the gutters, and replacing the mould and turf. The appearance of the meadow will not only be improved by this, but it may be more easily and effectually watered.

"The system I adopt for re-cutting a meadow or laying out a new one (where a good supply of water can be obtained) is to take a carrier gutter along the highest possible level of the meadow to be irrigated, the fall and width of the gutter varying according to the size of the meadow, the natural fall of the land, &c., tapering in size to its extreme end to prevent the necessity of many stops to make it water regularly. Below the carriage-gutter, and parallel with it, are cut minor watering gutters, about 9 inches wide by 6 inches deep, the distance between each averaging about 4 poles, and an adequate fall to enable them to carry sufficient water to their extreme end, supplied by a vertical feeding-gutter, crossing the level ones, through a convenient part of the meadow, as near the centre as practicable ; the watering-gutters branch right and left from the vertical gutter to the lower end of the meadow. Thus fresh water can be conveyed to the extreme or any desired part of it, without first flowing over and depositing its valuable sediment at the upper end, causing, as may be noticed in any watered meadow, the upper part, which has the first deposit of the water, to possess a rich and luxuriant herbage, whilst the lower part of the meadow is but little benefited.

"The chief objects to be kept in view in making watered meadows are, that sufficient water be taken to the most distant parts, and that the water be kept constantly in motion; for in meadows and marshes that are comparatively flat, there is danger lest the water should remain in a stagnant state, saturating the meadow instead of irrigating it. This evil is to be remedied by proper waste-water gutters, to draw the water from the hollows and take it at once to the hedge, ditch, or outlet, instead of allowing it to remain in a stagnant state, to evaporate in the atmosphere or to be absorbed by the subsoil.

"I find that the most practical way of managing a small stream, where the fall will admit of it, is to make a pond at or near the upper part of a meadow, varying in size according to circumstances, the quantity of acres to be irrigated, &c., so that the stream may be collected and preserved in the pond until it is full, and then drawn off by means of a self-acting stop-plug, which will lift itself when the pond becomes filled, and fall again when it is empty, without the aid of any one to superintend it. An acre or two at a time might be thus irrigated with a flush watering from a source which would otherwise be absorbed by the subsoil before reaching the surface."

In a subsequent communication Mr. Ellis refers to several instances of meadows he has laid out, as follows:—

"*Description of the Cost and Results of laying down to Irrigation a few of the Meadows.*—Amongst them is a piece of meadow-land adjoining the Exeter Railway Station, in the occupation of Mr. Smith, butcher, which possessed a very uneven surface and a fall of not more than about 1 in 200, but is sufficiently low to allow of a portion of the sewage of Exeter being taken over it, although with some little difficulty and extra expense from the uneven state of the surface and from the necessity of carrying it across the entire breadth of the meadow by a raised gutter, in order to take the water sufficiently high to irrigate the farthest side of the meadow. Notwithstanding this extra expense, the adoption of this plan has been attended with the most satisfactory results, although, from the extreme dryness of the watering season, the supply of water has been limited, and a much larger quantity been absorbed by the loose soil used in filling and levelling the ground.

"The total cost of levelling the surface sufficiently to irrigate, and the cutting of the irrigating gutters, was 1*l.* 10*s.* per acre. Had no formation of surface been required, the cost would have been under 1*l.* per acre. I have laid down a considerable quantity of meadows of late under that cost; amongst them are two meadows, of about 15 acres in extent, for Mr. Rew, of Exwick Barton, near Exeter, taking their supply from the river Exe, the total cost of which was 17*s.* 6*d.* per acre; also several meadows for Mr. Richard Browne, of Dunscombe, Crediton, taking their supply from the river Creedy, the total cost of which was 15*s.* per acre; also a meadow for Mr. Lerdon, of Eastecott, Crediton, being supplied by the liquid manure from the farm-yard, diluted with spring water, the total cost of which was 15*s.* per acre; also several other meadows, of about 40 acres in extent, for Mr. Jno. Osmond, of Hague Barton, Newton St. Cyres, a portion of which Sir Stafford Northcote, Bart., mentions in his paper on water-meadows in the Bath and West of England Society's Journal; from 40 to 50 acres for Mr. Row, of Newton St. Cyres, with liquid manure from the yard diluted with spring water, the total cost of which was 15*s.* per acre; about an equal quantity on an adjoining farm in the occupation of Mr. Elworthy, supplied by liquid manure and spring water, the total cost of which was 12*s*. 6*d*. per acre,—the surface of these meadows required no formation; also several meadows for Mr. Thomas Arnold, of Park Iddesleigh, taking their supply from the liquid manure of the yard and the sewage of the village, the total cost being 15*s*. per acre; also about 20 acres for Mr. Anning of Lyson, being supplied with liquid manure and spring water, the total cost being 12*s*. 6*d*. per acre; also a meadow for Mr. Wilcocks of Pengelly's, being supplied by spring water, the total cost of which was 15*s*. per acre; also several meadows for Mr. Frederick Loram of Alphington, at about an equal cost; a meadow for the late Rev. D. Gorham, Vicarage, Brampford Speke, taking its supply from the sewerage of Brampford village, at a cost of 15*s*. per acre; also a meadow for Mr. Beedell of Upton Pyne, being supplied by liquid manure from the yard, at a cost of 15*s*. per acre; also several meadows for Mr. R. Pidsley of Moor Lane, Sowton, being supplied by spring water. These meadows are risen in value, by irrigation only, 2*l*. per acre per annum. The grass of them was sold last year, from April to Michaelmas, for 7*l*. 10*s*. per acre. The results of irrigation in these meadows are extraordinary. They were watered about twenty years ago, but, from the non-success which attended them from their system, the watering them was abandoned until last year. I am informed that the grass in these meadows has been sold for the same period for several years previous, averaging from 3*l*. 10*s*. to 4*l*. 10*s*. per acre; the total cost of cutting, forming the land, and filling the old gutters was 1*l*. per acre. I have also laid out several meadows on the property of Martin J. West, Esq., for the tenants and myself, at Pembrey, Carmarthenshire, the results of which have been most satisfactory. There being no water-meadows in that neighbourhood, the amount of prejudice which existed among the farmers was very great against irrigation or any other improvements, and I found nothing but example would remove that prejudice, although they have a very considerable extent of land in South Wales at present in an almost worthless state, capable of being converted into irrigated meadows of the first quality. The meadows just alluded to are improved by irrigation to that extent that farmers come from many miles around to witness the results. There are a great many other gentlemen and farmers in this neighbourhood, and in almost every county in England, who have availed themselves of my system of irrigation, and have informed me that they can with pleasure bear testimony to the practicability of its nature, as well as to a considerable saving of outlay.

"E. ELLIS, Agricultural Engineer, &c.

T. D. Acland, Esq. "Alphington."

The foregoing communications are inserted with a view of showing that the system of irrigating with small gutters is a reality; and that its cheapness, and its profitable results, are becoming recognized. I was not aware, till this sheet came from the printer for its final revision, that Mr. Bickford was disposed to undertake the laying out of meadows on his own account. I learn from him, that hitherto he has been willing to see his plans extended by others; but finding them to be imperfectly carried out, he is willing to undertake work of this kind himself for the next two years. His plough, it is right to observe, is patented, but he can put any one into a position to cut his meadows for himself.

T. D. A., jun.

The Farmer's Note-Book.

1.—*Notes from Old Books.*

Contributed by R. W. Blencowe, Esq., The Hooke, Lewes, Sussex.

West of England Cheeses in Old Times.

If Cheddar cheese be not the best of all our native cheeses, which I am much inclined to think is the case, it certainly takes its place in the first rank as an aristocratic cheese, though the more plebeian Cheshire still holds its ground with the multitude.

There was a time, however, about one hundred years ago, when Somersetshire could not contend for the caseous crown with Wiltshire.

"Being," says Mr. Lisle, "with Stephens about East Lydford, near Somerton, in Somersetshire, and having business with a great many farmers, I found by Stephens and by the confession of those farmers, that, notwithstanding their lands were much richer than those of North Wiltshire, they could not pretend to make such good cheese as was made in North Wiltshire, and that cheese of the same sort would outsell the Somersetshire by 3*s*. or 4*s*. in the cwt. It was allowed also that the Somersetshire women could not make a cheese with a yellow coat like those of North Wiltshire, wherefore the Somersetshire women, to disguise it, put saunders into their milk to give a yellow colour to the coat of their cheese, which, giving a yellow colour also to the inside, when people put in the taster they found out the art, and upon discovery they made exceptions, for the inside of the North Wiltshire is white; and it was confessed by all and agreed that down further westward, though the lands were better, the cheese was worse than in those parts of Somersetshire which I speak of.

"They allowed also that at Winchester fair, if the fair was dull, the Somersetshire men must stay a day or two longer than the Wiltshire men before they could sell."—*Observations in Husbandry*, by Edward Lisle, Esq., late of Crux Easton, in Hampshire.

Hint from another quarter as to cheese:—

"The herb saxifrage, so little esteemed because not far fetched, is an excellent and proper herb, and fit to be nourished or sown in meadows, for amongst all housewives it is held for an infallible rule that, where saxifrage grows, there you shall never have ill cheese or butter, especially cheese, whence it cometh that the Netherlands abound much in that commodity, and only as it is supposed through the plenty of that herb.

"It would be a very acceptable service to the whole nation if those that have land enough would yearly prove some small proportion of these vegetables, not yet brought into common use, by which means they would not only advance their own estates, but the whole nation in general, and gain unto themselves everlasting fame and honour, as did the family of Piso, Fabius, Lentulus, and Cicero, by bringing into use the several pulses now called by their names."—*Systema Naturæ.*

There is good reason to think that three centuries ago Som setshire was the wealthiest county in England. In the y 1547, when a tax under the more gracious name of a benevolence was levied on all the counties, the highest sum was paid by Somersetshire; next came Kent, then Essex, Devon, Suffolk, and Norfolk; the quota paid by these counties varied from 6000*l.* and 7000*l.* to 4000*l.* and 5000*l.* Lancashire paid only 500*l.* The midland, southern, and western were more wealthy, more civilised, and more important than the northern counties in those days—a curious contrast to the present state of things.

Manures at Lyme—in Old Times.

"There was a time when sea weed, or ore weed as it was called, was valuable as a manure when burnt to ashes. The Lyme Borough accounts in Edward VI.'s reign show that a regular income was made by letting the right to cut and harvest the ore or sea weed growing upon the ledges which are dry at low water to the extent of 500 acres. The ore burning there let, in 1589, for three years at 40*s.* a-year.

"The chemists have found out a much cheaper way of obtaining alkali an put an end to the burning of sea weed."—*Robert's Social History.*

Games in the West.

It would be curious to inquire what are the reasons wh peculiar games prevail so decidedly in different counties. How it is that in Kent, Surrey, and Sussex crowds of people will si for hours together watching with intense interest a game o cricket in which only two-and-twenty of the whole party ar practically engaged. And this is no recently acquired taste—15 years ago, when one parish challenged another, the children o the village school had a holiday given them that they migh witness the contest. Travelling further westward we fin wrestling and single-stick, in which Tom Brown acquired th rudiments of his manly character, the delight of the peasant When Cann and Polkinghorne contended for the mastery i wrestling at Plymouth tens of thousands gazed upon the struggl with intense anxiety, feeling that the honour of their respectiv counties was at stake.

The Cornish men have always been remarkable for their skil and power in athletic games and exercises. Their natur energetic and independent character has caused this, and th practice of these manly sports has reacted upon that characte As archers they were the best bowmen in England, and coul shoot further and with a truer aim than any others. Of thei practical good sense and energy there can be no stronger pro than the way in which they have emancipated themselves (totall differing in this respect from the Irishman, the Welshman, an the Highlander) from the trammels of their own old Celtic language and adopted that of England. Ray, the Naturalist, who travelled through Cornwall in 1662, could hear only of one man, and he lived in the parish of St. Just, who could write the Cornish language; he met with none but what could speak English, and very few of the children who could speak Cornish; "so," he adds, "that language is like in a short time to be quite lost." To recur, however, to the games and sports of Cornwall, there is one which Ray alludes to which is, I believe, almost entirely disused now, that of hurling; of which he had the following curious description given him:—

"There are two kinds of hurling, the in-hurling and the out-hurling. In the first, there are chosen twenty or twenty-five a side, and two goals are set up; then comes one with a small hard leather ball in his hand, and tosses it up in the midst between the two parties; he that catches it endeavours to run with it to the furthermost goal; if he be stopped by one of the opposite side, he either saith I will stand and wrestle with him, letting the ball fall by him (which one of the opposite side must not take up but one of his own), or else throws the ball to one of his own side (if any of them can catch it). He that is stopped may choose whether he will wrestle or throw away the ball; but it is more generous to wrestle. He that stops must answer and wrestle it out. When any one wrestles, one of his side takes up the ball, and runs away with it towards the goal till he be stopped, and then as before he either wrestles or throws away the ball, so that there are commonly many pairs wrestling at once. An out-hurling is played by one parish against another, or Eastern men against Western, or Devonshire men against Cornish. The manner they enter it is as follows:—Any one that can get leave of a justice, &c., goes into a market-town with a little wooden-ball in his hand, plated over with silver, and there proclaims the hurling, and mentions the time and place. They play in the same manner as in the other, only they make their churches their goals. That party which can cast the ball into or upon the church wins. In an out-hurling they have not a set number on each side, but each have as many as they can procure. An hurler, to help him in running, may catch hold on a horseman's stirrup. No horsemen play."

And now that we are upon the subject of wrestling, let us see what was the opinion of Sir Thomas Parkyns, Bart., of Bunny, in Nottinghamshire, an enthusiastic admirer of the sport. He wrote a curious treatise on the subject, which he published in 1714, called 'The Inn Play or Cornish Hugg Wrestler.'

"When I was at Cambridge," he says, "as a spectator I observed the vast difference betwixt the Norfolk out-players and the Cornish huggers, and that the latter could throw the other when they pleased. . . . .

"When I went to Gray's Inns of Court and applied myself to the several Masters of the Academy, to learn fencing and vaulting, I met with Mr. Cornish (by name), my Inn Play Wrestling Master; and when I found so much variety in the several holds that it was impossible to remember half of them without committing them to paper, and telling him my design, he said he had taught five hundred scholars, but never any one could set them down, and that it would be in vain to attempt any such thing."

Sir Thomas, however, set to work, and in two months succeeded, and the Treatise was the result; "being determined," he says, "to do his endeavours, both hip and thigh, that wrestling should be no longer looked upon by the diligent as a mystery."

From my experience of the kindness and good temper of the men of Devon and of Cornwall I am satisfied that the worthy Baronet is right when he says,

> "Some, perhaps, may object that wrestling is of no use, but apt to make a man more contentious and quarrelsome, and fit only to break men's bones; to which I answer, that you seldom find a gamester indeed but is superlatively passive, but will put up with what another shall call and resent as an affront; neither do you find that a true gamester does, or receives any harm but when highly provoked. Instead of a true gamester being contentious or quarrelsome, he'll laugh at small indignities, and with the mastiff dog rather than bite lift up his leg upon the little wafling yelping curs in contempt."

It is in this spirit that he recommends the following mode of treating "a contentious man:"—

> "If you have a companion that disturbs your mirth and would be rid of him, with your left hand take hold of his collar behind and with your right put between his legs far up, lift him up easily and thrust him out of the room, for he can never turn upon you, but if you lift him too hard you'll throw him on his nose."

* * *

To the well-known courage and hardihood of the Devonians there was one amusing exception in the time of the Protector Somerset. When the Devonshire peasants rose in open insurrection, ten thousand of them laid siege to Exeter, and if there had been no braver spirits in the town than the Mayor, the metropolis of the West must have fallen.

> "One Barnard Duffield," says Hooker, the historian of the siege, "having differed from another leading man, John Courtenay, the Magistrates sent him to prison. Upon which his daughter repaired in flaming indignation to the Mayor and demanded his release, which thing being denied her, she waxed so warm, that not only she used very unseemly terms and speeches unto the Mayor, but also contrary to the modesty and shamefacedness required in a woman, specially young and unmarried, she ran most violently upon him and strake him in the face."

The Mayor, it seems, roared out for help, and was rescued and carried home in safety, being, as the writer adds, "a merchant and only exercised in that trade, he had small reach in matters of policy or martial affairs."

2.—*Extracts from Magna Britannia and other Books.*

Communicated by G. Townsend, Exeter.

Glebe and Soil.

"The glebe and soil of *Devonshire* is something different from others, and has some peculiar qualities in it. The eastern part of it is very good for sheep and corn, where it is chalky; but in other places, where 'tis marly, it is a great enemy to sheep, for it melteth their fat and corrupteth their flesh, tho' it seems to plump them up speedily. Here are two sorts of marle, *viz.*, blue and red; the blue is excellent for pasturing beasts, and the red hath a property to make barren ground fruitful; but it does little or no good to a fertile soil. In the spring and fall of the year, after a shower of rain, you can hardly endure to sit on the ground, the heat will be so piercing, which proceeds from the heat and binding nature of the soil, which casteth it upwards. The south parts are more plenteous both in grass and corn, and may be called the garden of *Devonshire*; but the north and west being chiefly hills and moors, are hardly improvable, unless in some few places, where there is a red soil, and near the sea."

Fruit Trees and Cider.

"The trees are of as great variety in these parts as in any other places of the kingdom, and fruit-trees are very plentiful, especially apples, with which they make such great quantities of sider, that many of the copyhold tenants pay their rents with the profit of it only. The merchants, who go great voyages at sea, find it a very useful drink in their ships, and so buy up store of it; for one tun of sider will go as far as three of beer, and is found more wholesome in hot climates. 'Tis said also, that since there has been a scarcity of *French* wine, thro' our want of commerce with *France*, there has been 10,000 hogsheads of sider exported yearly from this county to *London*. How it has been made use of is hard to know. Little or none of it can be had neat any where in that city, and therefore it is a common and probable conjecture, that it being of a more vigorous and high spirit than the *Hereford* sider itself, it has been made use of by the vintners in *London*, with other ingredients, to brew a sort of claret, which will pass very well with common drinkers who have no judgment. Nor may it be impossible that the best sort of it, which is made about *Southam*, being kept long, and artfully managed and mixed, may better pass for white-wine, it having as good a body or better than common white-wine has."

Inhabitants.

"The *Devonians* at this day do not degenerate from the virtues and excellencies of their ancestors, for they are a bold, hardy, and brave people, to the last degree, and endeavour much to maintain their post of honour and reputation in the world. They are of well-compos'd constitutions of body by nature, apt to all good exercises, and soon instructed in any employments, civil or military. The meaner sort are strong and robust, able to endure all sorts of labour and toil both by land and sea, in which many of them are continually employ'd with great drudgery, as labouring in the mines and fishery. The trading part is diligent and industrious, and by their manufactures in making and selling serges, perpetuanas, druggets, fine and coarse cloths of divers sorts, and lace, acquire great wealth, and maintain many families."

William of Malmsbury's description of the neighbourhood of Exeter gives but a sorry picture of the agricultural skill of that period; he says:—

"This city, tho' the ground about it be wet and filthy, and will scarce bear a crop of bad oats, often yielding empty ears without any grain in them, yet by reason of its stateliness, the richness of the citizens, and resort of strangers, all kinds of merchandize is so plentiful in it, that nothing necessary is wanting."

A later description (1713) of the county generally shows an improved state of things.

"The air in y^e vallies is mild; on y^e hills, sharp and healthful. In y^e western parts the soil is adapted to y^e breeding of oxen, and in the northern parts to sheep; the eastern and middle parts yield plenty of corn, and the best pease in England. South Devonshire is esteemed a very garden."

From the authority above quoted I select the following amusing description of the Devonians:—

"In this county y^e gentry are as well bred, and the yeomanry and lower people as unpolished, as in any part of England. The merchants and principal tradesmen imitate the gentry."

More improved and highly complimentary to the ladies is the state of the inhabitants of Exeter in 1797.

"The people are industrious and courteous; the females truly fair, and very numerous, of easy carriage and attractive manners."

The names of places in Devonshire have undergone strange mutations; some of them will hardly be recognised in their old costume: the following list is from an old Distance Table:—

"Chimley N.W.
Culliton N.W.
Ilfarcombe N.W.
Hunyton N.E.
Autre E.
Bradninge N.E.
Tyuerton N.
Chidley S.
Ockington W.
Columpton N.E.
Moulton N.W.
Bydiforde N.W."

Others from an old Map, entitled 'Devonia, vulgo Devonshire:'—

"Excester
Chidlay
Columbton
Teuerton
Tauestok
Plimouthe
Chegforde
Dart-more
Apledor
Berrynerbort
Houlsworthy
Combe in tene
Dulish
Limston
Affington
Ede
Poltymon
Newtonsyres
Whitston
Dunsedick
Peamount."

Many of our agricultural friends may not have met with the origin of the name of the favourite "Rasher;" it is thus given by Mr. Charles Knight, in his interesting publication, 'Old England:'—

Bacon.

"The Anglo-Saxons had oxen and sheep; but their chief reliance for flesh meat, especially through the winter season, was upon the swine, which, although private property, fed by thousands in the vast woods with which the country abounded. Our word *Bacon* is 'of the beechen-tree, anciently *bacon*, and whereas swine's flesh is now called by the name of bacon, it grew only at the first unto such as were fatted with bacon or beech mast.'"—*Old England*, vol. i. p. 67.

3.—*Notes on Sheep-Farming in New Zealand, with a short Notice of the Canterbury Province.* By JOHN BARTON ACLAND, Mount Peel, Province of Canterbury, New Zealand.

THE following account, given by a West-Countryman, of his experience in a distant colony, will, it is hoped, be kindly received by the members of the Bath and West of England Society. As they are about to visit South Wales in 1858, perhaps, at a future day, they may extend their operations to New South Wales, and thence take a trip to New Zealand. At any rate, the opportunity of learning the difference between sheep-farming in New Zealand and sheep-farming on the western hills may not be without some interest to those who are content with fire-side travelling for the present.

It is only during the last few years that New Zealand has opened as a prosperous field for colonization. That it has been so opened is in part owing to the discovery of gold in Australia, which has drawn the attention of the colonizing portion of the public to the prospects of the Australasian colonies generally.

New South Wales, the first portion of Australia colonized by the English, was founded, in 1788, as a convict settlement; and, after a time, free emigrants began to go out. At the commencement of the present century we begin to hear of New Zealand as a whaling-station, and of a certain amount of trade springing up: the principal articles to be procured in those days from New Zealand were spars, flax, and preserved human heads. Missionaries went to New Zealand in 1814, but no systematic colonizing commenced till 1839. Meantime the Australian settlers had discovered that sheep-farming was a profitable speculation, and within the last thirty years the amount of wool sent from the Australasian colonies has increased to an enormous extent. In 1828 the total weight of wool imported into England was 30,235,915 lbs., of which about 22,000,000 lbs. came from Germany, and from Australia and Van Diemen's Land only 1,574,186 lbs. In 1856, the total import of wool was 116,211,392 lbs., of which 52,052,139 came from the Australasian colonies, and in 1857 the quantity imported was 127,390,885 lbs. At the same time the import of German wool has decreased to about 10,000,000 lbs.

The population of Australia is now about one million. The systematic colonization of New Zealand commenced in 1839—less than twenty years ago. The settlers for the first ten years had very great difficulties to contend with; but the Anglo-Saxon race is not easily discouraged, and the difficulties have been in a great measure overcome. Many settlers, attracted by what they heard of the capabilities of the country, went over from Australia, many belonging to the upper classes went out from England,

and the white population now numbers about fifty thousand souls. There is a great difference in the character of the two principal islands included in the colony of New Zealand. Taken together, they are rather larger than Great Britain and Ireland, containing nearly eighty millions of acres, and extending over fourteen degrees of latitude—viz., from 34° to 48° south.

These two islands are termed the Northern Island and the Middle Island—there being a smaller island to the south. The Northern Island, with the exception of part of the province of Wellington, is not adapted for sheep-farming. There are about seventy thousand of the Maories, or aboriginal natives, dispersed over it, and large tracts of country are so entirely covered with dense forest as to preclude the possibility of any sort of agriculture until the ground has been cleared, which is to be done only at a great expense. The Middle Island is very different; the entire number of natives is under two thousand. The forests are nowhere so extensive as to interfere with sheep-farming. In some parts timber is so scarce that the settlers have to go a distance of ten, or even twenty, miles to fetch their firewood, wood being the universal fuel of the country. Coal is found in many places, but of an inferior description. There is probably no one part of New Zealand—or, perhaps, of Australia—so admirably adapted, in its wild and uncultivated state, for pastoral purposes as the eastern part of the province of Canterbury, which province occupies the middle portion of the Middle Island. The great extent of well-watered plains; the low hills between the plains and the snowy mountains; the stony ground preventing footrot; the absence of forest; the freedom from the dingo, or indigenous wild dog of Australia—all mark this province out as pre-eminently a pastoral district, until the time shall come when the settled and cultivated districts have so far expanded that agriculture will take the place of sheep-farming.

The Canterbury plains, as above stated, are on the eastern side of the Middle Island, and about a hundred and twenty miles in length, by from twenty to forty-five in breadth, containing between two and three millions of acres between the sea and the base of the mountains.

With the exception of Banks' Peninsula—a mass of hills, of volcanic origin, and varying from one thousand to three thousand feet in height—the entire line of coast bounding the plains is one uninterrupted, low, sandy, or shingle beach. The plains appear, at first sight, perfectly flat; but there is, in fact, a gradual rise of about twelve feet in the mile from the sea towards the mountains. These mountains rise to a height of from five thousand to eight thousand feet, and their summits are covered the greater part of the year with snow. Between the plains and mountains are a considerable number of comparatively low hills, rising from five hundred to fifteen hundred feet above the plains. These low hills, as well as the greater part of the plains, are well adapted for feeding sheep, while the parts of the plains near the sea are swampy, and at present only fit for cattle; but being easily drained, and consisting of a fine alluvial soil, will ultimately prove to be the best agricultural land. The plains are divided, as it were, into sections by rivers, of which there are three large, six smaller, and many others, comparatively insignificant. The three largest—named the Waimakeriri, Rikaia, and Rangitata—take their rise a long way back in the Snowy Mountains (indeed, the source is not known of any one of them), flow through narrow valleys and precipitous gorges, and cut right through the ranges nearest the plains. They are sometimes impassable for weeks together: this occurs in the early part of summer, when the snow is melted, either by thunderstorms in the hills, or by a hot wind, termed by the settlers a nor'-wester. The six smaller rivers are seldom affected by snow, but rise rapidly with rain, and are sometimes impassable for a day, but seldom more. The writer has seen a horse swimming in one of them after eighteen hours' rain, whereas, the day before, the water would probably have been but little above his knees. These rivers are a great drawback to the country, being far too rapid to admit of navigation, too broad to admit of bridges being thrown over them, except at an enormous expense, one having a shingle bed a mile wide, which in a high flood is entirely covered, and from the shifting nature of the shingle it is difficult to establish a permanent ford or ferry.

Still, the rivers have their advantages. New Zealand is always a well-watered country, instead of being subject, like Australia, to be parched up with drought; and for the sheep-farmer they form admirable boundaries. The climate (I speak of Canterbury in particular) is splendid, and generally suited to the constitution of Englishmen. There are, perhaps, within certain limits, greater and more sudden changes of temperature than in England; but, on the whole, it is far more temperate, seldom oppressively hot in summer, while in winter, except on the hills, frost and snow are almost unknown. There is less rain than in England, the average number of wet days in the year having been estimated by some persons as low as a hundred, by others as high as a hundred and thirty. In London the number is about a hundred and sixty.

The above remarks on the general aspect of the country will show that it is well suited for sheep; and the breed which is found to answer by far the best, combining, in the most advantageous proportions, weight of carcase, weight of fleece, and value of wool per pound, is the German or Spanish merino. It has been said by F. A. Weld, Esq., an eminent New Zealand sheep-farmer, that "as a general rule the heavier breeds of sheep formed for a life of luxury and ease, are as much out of their element on our New Zealand uplands as an alderman of London would be had he daily, gun in hand, to seek his sustenance in our tangled forests." I do not know about the sheep, but I think that the health of the alderman might possibly be improved by the process.

The merinos were taken out, in the first place, from Spain and Germany, to Australia and Van Diemen's Land, whence they have been introduced into New Zealand, and some gentlemen have gone to a great expense in procuring pure merino rams from Germany, for the sake of improving their flocks by introducing fresh blood. The merino in New Zealand attains an average weight of from fourteen to sixteen pounds per quarter; but generally the weight of the carcase is a secondary consideration with the sheep-farmer, except in so far as a small animal cannot carry a large fleece, for the chief profit lies in the wool. In New South Wales the wool is of a somewhat finer quality than in New Zealand, but the fleece seldom weighs more than from two pounds and a quarter to two pounds and a half, while in New Zealand a good flock should always average from three pounds and a half to four pounds, and often more. One gentleman, with a flock of nearly five thousand sheep, told me, in 1856, that his preceding clip had averaged four pounds and a quarter all round, though many lambs had been shorn.

I cannot, by taking the average of past years, give a fair estimate of the value of New Zealand wool, because, for reasons to be presently stated, it is steadily rising in price: still the price may be said generally to be from 1*s.* 6*d.* to 2*s.* per pound in England. Last August some scoured New Zealand wool was sold at the high price of 2*s.* 9*d.*, and some wool (clean but not scoured) belonging to the writer realized 2*s.* 0½*d.* Wool was then unusually high; it has now fallen; but the price current for March, 1858, quotes 'New Zealand scoured,' 1*s.* 11*d.* to 2*s.* 9*d.*, and 'average to good,' 1*s.* 6½*d.* to 2*s.* 0½*d.* The highest price quoted for Australian scoured is 2*s.* 11½*d.*; a slight calculation will show that the increase of weight in the New Zealand fleece more than compensates for the greater value per pound of the Australian. For some time the New Zealand wool was sent to this country very badly got up, partly from carelessness, partly from the inexperience of the sheep-farmers, who were, in fact, only learning their business, and partly from want of labour.

Many of the sheep-farmers knew little about sheep, and cared less, and thought that, so long as the animal had four legs and carried a certain amount of wool on his back, all was right. The consequence, of course, was, that many had inferior and mixed flocks: now, however, they are becoming more experienced, and pay more attention both to the quality of their sheep and the getting up of the wool, which is also becoming more known in the London market, and valued as a fine combing-wool.

Before speaking of the general management of sheep, it will be as well to mention the way in which a sheep-farmer settles himself on his sheep-walk, or 'run,' as it is called, and also to state the terms on which he holds it. A man with good practical and sound common sense, who makes it a rule to profit by every mistake—*i.e.* never to do the like again—may do very well without having had any previous agricultural knowledge. Amongst our Canterbury sheep-farmers I can reckon clergymen, barristers, doctors, officers of the Austrian as well as the English army, sailors, both royal navy and merchant service, besides farmers by education and country gentlemen. The best course for a man to adopt who intends sheep-farming is to reside six or twelve months at a sheep-station, where he will learn his business, and probably gain some experience without paying too dearly for it. He must then explore unknown or unoccupied country, until he finds a tract suitable for his purpose. He then goes to the land-office of the province, describes the natural boundaries, the estimated extent of country, and the number of sheep he intends to place on it.

The extent of run granted is regulated by the number of sheep. Sir G. Grey, when Governor of New Zealand, adopted a sort of sliding-scale, taking into consideration the quality of the pasture. If a man started with five hundred sheep, he was allowed pasturage sufficient for five thousand; if he had one thousand, pasturage was given him for seven thousand five hundred; if he had two thousand, he was allowed pasturage for eleven thousand five hundred, and so on, the addition decreasing, to prevent monopoly, but at the same time allowing a reasonable increase for the sheep-farmer's flocks, as the number he starts with—say a thousand breeding-ewes—will not pay expenses till the end of his third year, when his flock should consist of three thousand to four thousand sheep and lambs.

In the Canterbury province the system is altered; the sheep-farmer is allowed twenty acres for every sheep, whatever number he begins with; this allows for a fivefold or sevenfold increase, according to the quality of the pasture. The sheep-farmer receives a license to occupy for fourteen years; this license he forfeits if he does not stock his run within twelve months; he also has to vacate if the fee simple of the land is bought by a land-purchaser, although he is allowed a certain pre-emptive right over parts of his run; the rent however is almost nominal—one farthing per acre per annum for the first two years, one halfpenny per acre per annum for the next two, and three farthings per acre per annum for the remainder of the fourteen years. Sir G. Grey's regulations as to rent were different—rather lower. First, 1*l.* per annum for each thousand sheep that the run was considered capable of carrying, and one penny per annum for every sheep actually on the run. For all purposes of estimating stock, each head of horses or horned cattle is considered equal to six sheep.

When the sheep-farmer goes to occupy his run, he must take at least two or three men with him to saw and split timber, put up his house, stock-yard, sheep-yard, and wool-shed. If he takes his sheep with him, he will want a shepherd as well; the best way is not to take the sheep until the house and sheep-yards are up, which may be done in two months. If shearing-time is coming on, he must also make a place to wash his sheep; he will also wish to enclose a spot of ground for a garden—a few potatoes, at least, are invaluable. If he can also enclose fifty acres as a paddock for his horses he will find it most useful.

As to capital, he ought to have not much less than 2000*l.* in order to begin in the most advantageous manner; he will be probably able to buy a thousand ewes with 1000*l.* His dray, team of eight bullocks, tools, household utensils, the first year's stores, and the expense of putting up house, &c., will cost over 500*l.*; and he ought to have nearly 500*l.* in reserve, to meet wages at the end of the year, and any casual expenses, as the first year's wool will certainly not cover the annual expenses, and it is doubtful whether the second year will, but the third ought to pay well.

The general management of a flock of sheep in New Zealand differs widely from the English system. In the first place, two thousand is considered a fair number for a flock; quite enough, but by no means excessive. The sheep are left as much to themselves as possible, the main business of the shepherd being to keep the flock on their proper feeding-ground: he ought to visit the flock every day to see that none are missing, and even with a flock of the size mentioned, he ought to perceive whether this is the case at a glance. The process of counting would be difficult, if not impossible, on open ground, unless the shepherd had two or three *perfect* sheep-dogs—a class of sheep-dog not often met with in New Zealand, though sometimes found in the Highlands of Scotland.

The extent of country required by a flock of this size is very considerable. It is generally considered, by those who have had the most experience in the matter, that on the average three acres of land in the wild and uncultivated state are required to support one sheep.* Now, I do not mean to say that three acres of wild land are always required to keep one sheep throughout the year; I think that often a sheep would do well on far less, and in other cases would starve in the midst of plenty on six acres. The case is this: the only way in which a sheep-walk, or 'run,' is cultivated, and the pasturage improved, is by putting a lucifer-match under a tuft of grass, and setting the whole country in a blaze. About three weeks after this, the grass comes up young and tender, and the sheep delight to feed on it; but after some months it becomes rank, and the sheep will almost starve rather than feed on it. The second year the tufts of grass are full of yellow seed-stems and withered bents, though there are some young and tender grasses and plants growing between, and the third year the grass will burn again. From this it will be evident that though the sheep may require his three acres, he probably will not feed over more than one-half in any year; and it is my own belief, that as the runs become fully stocked and more regularly fed over, the land will support a greater number of sheep (perhaps one sheep on two acres), while the grass will seldom, if ever, require burning; at present it is absolutely essential, as, in the first place, the rough grass and some small prickly shrubs can be cleared off and kept down in no other way that will pay for the labour; and second, the character of the grass is wonderfully improved after one or two burnings.

The lambing season is of course a most important and anxious time for the sheep-farmer, and, singular as it may appear, the sheep-farmers have not yet been able to decide which is the best season for lambing, and both the spring lambing and autumn lambing have their most strenuous advocates. Some sheep-farmers, when commencing with a small flock, which they are anxious to increase as rapidly as possible, turn the rams into the flock, and leave them there, and, in fact, lamb all the year round. No one defends this system, but some have adopted it for the first two years, and obtained a very large increase. Others have, with the same object of rapid increase, put the rams into the flock twice in the year, generally in March and September; this will probably succeed the first year, and a large increase be obtained; but from my own observation I think it likely that after the first or second year only about half the flock would take the ram at each season, and therefore no advantage be gained. Others, with better success, will have three lambings in two years; the first probably in February, the second in October, and the third in June. The last-mentioned month, June, is a bad one, being midwinter, and there is great danger of bad weather, in which case, as no shelter can be afforded to the flocks, numbers of the lambs would die. All these several plans, however, would certainly be given up as soon as the run became fully stocked, as one lambing would be found amply sufficient to maintain the flock in the best condition, and the sheep-farmer has then to choose, between autumn and spring. My own opinion is that autumn is the best, for this reason: that although the vegetation is not entirely checked either by heat in summer or cold in winter, yet a very hot summer might make grass very scarce. In autumn, after the summer heat is passed, there will be plenty of food to enable the ewe to keep up her condition certainly through the greater part of winter. The lamb will be weaned on the fine young spring grass, and will, at shearing time, have a good nine-months' fleece on him. But now I must be careful, for I have heard that one of the great offences of which the New Zealand sheep-farmers are guilty is that of "actually sending home wool shorn from sheep nine months old as 'lambs'." In my ignorance, I supposed all sheep under a twelvemonth old to be lambs, and should consequently have supposed wool shorn from a sheep nine months old to be lamb's-wool. I never had any to send of that description, but if I had, I should have called it lambs'-wool.

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* Lest my readers should suppose from this, that New Zealand in general, or the Canterbury plains in particular, is a barren and unproductive spot, I will here mention, that in Canterbury, near Christchurch, the average yield of wheat per acre is 40 to 50 bushels, sometimes even 60; and on one farm the average one year of the whole quantity of land in wheat was 56 bushels, and one measured acre yielded 70! and this without manure. After taking three crops the land is usually laid down to grass.

If the sheep-farmer prefers autumn lambing, he should commence at the beginning of March, and finish before the end of April, "our autumn;" or if he chooses the spring, it should be September and October. The choice of the lambing time may very much depend on the shearing. If the sheep-farmer intends to shear as early as possible—that is, in October or November—there can be no question that autumn is the best time for lambing. If, however, late shearing—January or February—is intended, the lambing then would be better in September, as the lambs by January would be fit to wean; and it is needless to say that young lambs about with the flock in shearing time are a great nuisance.

About a fortnight after the lambing is over the operation of "cutting and tailing" is performed, and then the sheep-farmer takes stock of his lambs.

The merinos are not a rapidly increasing breed of sheep; they seldom have doublets like the Leicesters, and 80 per cent. of lambs is considered a very good return; it is, in fact, a high average; few would grumble at 70.

Next to lambing, shearing is the most important season; it is, in fact, the sheep-farmer's harvest. The number of shearers being limited, the shearing usually goes on from October to March; I should consider the end of November about the best time.

Too little attention is often given to the washing, yet on this the getting up of the wool depends. Some persons will content themselves with swimming the sheep through a pool or branch of a river once or twice; others, after throwing the sheep into a pool, and letting them swim for about five minutes, pass them separately before a man who stands in a tub fixed at one end of the pool, examines each sheep separately as it passes, and sees that it is thoroughly clean. A third method is what is termed spout-washing: each sheep, after swimming about, and soaking for five minutes, is brought under a shoot of water falling from a height of about two feet; the sheep is held under this for about half a minute, and turned over so as to bring, as nearly as may be, all parts of the fleece under the spout. This method effectually cleans the fleece, but is said by some persons to knock it about too much. By this last method, three men could wash about six hundred sheep in the day; by the second, I know, speaking from experience, that two men and a boy *can* wash twelve hundred, and look after a flock at the same time. The shearing generally begins about three days after the washing. The shearers get through their work with a rapidity unknown in England. A man would be thought a poor shearer if he could not shear sixty sheep in a day; the usual number would be seventy or eighty, and some men will shear a hundred. The shearers are paid 1*l.* to 1*l.* 5*s.* per hundred, are fed, and generally have an allowance of spirits besides. The fleeces are folded up, not tied, and packed in bales, which weigh from 300 to 380 lbs., according to the way in which they are packed.

There is one other less pleasant operation which sometimes takes place at a sheep-station, which the sheep-farmer would gladly never see or hear of, unless obliged; I mean dipping for scab. The sheep are singularly free from most of the diseases which affect them both in England and in Australia; catarrh and foot-rot are unknown. The fly never touches the live sheep; and yet the country swarms with blowflies. Scab, however, is very prevalent in some parts of the colony. The provincial council (*i. e.*, the parliament) of the province of Canterbury have passed some very stringent laws on the subject,* not only fining a man for importing or driving scabby sheep, but making the mere possession penal; the owner is allowed six months from the time of the disease breaking out to clean his flock, and at the end of that time, unless the sheep are clean, he is fined 1*s.* or 5*s.* per head; and if one scabby sheep is found, the whole flock are, by law, scabby also.

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* One gentleman standing for a seat in the Council said, in addressing his constituents, that he "came forward actuated solely by scab."

The consequence of these laws is, that there are not above four or five scabby flocks in the province, and the owners are doing their best to clean them. The apparatus used for dressing is not one of those pretty little machines we see in the show-yard of the Royal Agricultural Society, but a good, strong, serviceable trough, about twenty feet long, five feet wide at the top, and four and a half deep. Into this the sheep are thrown bodily, allowed to swim about for two or three minutes, and then walk up an inclined plane on to a stage large enough to hold one hundred and fifty sheep, where they stand to let the stuff drain off from them. With a trough like this, and a couple of boilers holding one hundred or two hundred gallons each, going all day, five men would dip three thousand sheep.

Every man who knows anything about sheep has, of course, an infallible recipe for curing scab; and there are at least a dozen different ones in New Zealand, and none of them successful. The usual dipping mixture is compounded of arsenic, soda, corrosive sublimate, sulphur, tobacco, spirits of tar, and sulphuric acid. One or more of these drugs, mixed in special proportions, according to the particular infallibility which is to be tried.

The great difficulty of cleaning the sheep consists, I believe, in getting a clean muster; for if one is left behind, the whole flock may be reinfected. The sheep are generally dipped three times at intervals of ten days, and they ought to be put on fresh ground after each dipping.

Sheep are occasionally dipped in tobacco after shearing, to kill the ticks; the tobacco is also said to improve the growth of the wool, acting as a sort of Rowland's Macassar. The tobacco may be grown at the station; it will grow well in most parts of New Zealand, but it is a very exhausting crop, and an old sheep-yard is considered the best place to grow it.

I stated above that the Dingo or indigenous wild dog of Australia is unknown in New Zealand; this is true, but there are a certain number of wild dogs of a mongrel breed, runaways from the native pahs or villages, and sometimes crossed by dogs belonging to the settlers. These dogs occasionally come, and do serious damage among the flocks; then, of course, the settler must be on the look-out, watch the flock by night, gun in hand, or else set baits, poisoned with strychnia. This latter plan is inconvenient, because you cannot use your own sheep-dogs on the poisoned country. These dogs are very seldom met with, and soon destroyed by the settlers.

I will now mention some statistics connected with the Canterbury province, first requesting my readers to remember that the settlement was founded in the year 1850, and that the first body of colonists landed in December of that year.

In March, 1857—or only six years and three months after they landed—the population amounted to 6,230. In January, 1856, it was 5,347. The amount of land fenced in, in March, 1857, was 24,357 acres, of which 4,027 were in wheat, 360 barley, and 918 oats.

The amount of stock in the province, both in January, 1856, and March, 1857, is shown by the following table:—

	January, 1856.	March, 1857.
Horses	1,189	1,307
Mules	13	20
Horned cattle	12,424	15,355
Sheep	220,788	276,089
Goats	401	336
Pigs	4,996	5,817

The wool exported from Canterbury in 1856 amounted to 791,621 lbs.

The entire value of the exports in that year was estimated at 60,386*l.*, and of the imports at 88,012*l.* The exports, however, were undervalued, for the wool alone would amount to more than the sum named. Parts of the Canterbury province are still so little known that it is difficult to estimate the pastoral capabilities of the province, but I think it is no exaggeration to say that the province will support two millions of sheep, and that (counting each head of cattle as six sheep) within ten years there probably will be that number.

I may perhaps be excused for concluding this paper by saying a few words to a class of persons who would do well if they packed up their boxes, and started, by the next ship, for New Zealand: I mean small farmers, industrious, hard-working men, but possessed of too small a capital to hold their own against the competition of the present day, who find themselves, slowly but steadily, going back in the world, step by step, in spite of all their endeavours, until they see clearly that they or their children will end by being mere labourers. Now, the industrious man of this class had better save what he still has left, and emigrate. The idle ones may as well stop at home; we do not want them. The hard workers are just, of all others, the men fitted for colonists.

Men go out to the colonies for various reasons :—

First. A man may go out merely officially, holding some military or other Government appointment.

Secondly. He may be travelling in search of health, or pleasure, or for scientific purposes.

Thirdly. He may go out intending to make as much money as he can in a few years, and return to England.

Fourthly. He may be wishing to improve his condition by finding and making for himself a new home in a new land, and, as a true colonist, be prepared to cast his lot in with the fortunes of his new country, be they what they may.

It is to those who have this last object in view that New Zealand offers special advantages, and it is with this object that the class of persons to whom I have alluded should go out. Let them not form visionary ideas of making fortunes; they will not do that, but they may, one and all, make a solid improvement in their condition, acquire a moderate competence, and leave their children settled on their own freehold land, in a fair way of doing well. I have stated above that a man possessed of 2,000*l.* may engage in sheep-farming; but a man who lands in the colony with a tenth part of that sum* in his pocket may buy twenty to forty acres of land at 2*l.* per acre, and engage in agriculture; but even if he has been a farmer in England, he will do well to lay aside his pride, and go and work as a labourer for five or six months, until he is able to form his own judgment as to what will be the wisest course for him to pursue in his individual case. He need not be ashamed of working thus; better men have done it before, and probably will do so again.

Let him take as his motto the chorus of the emigrant's song :—

Cheer, boys, cheer, for England, mother England!
Cheer, boys, cheer, the willing, strong right hand!
Cheer, boys, cheer, there 's wealth for honest labour!
Cheer, boys, cheer, for the new and happy land!

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* The expense of a passage to New Zealand is—first cabin, 40*l.* to 60*l.* per head; intermediate, 25*l.* to 30*l.*; and steerage, 18*l.* to 22*l.* Besides this, the outfit of clothes and bedding will cost about 5*l.* Strong clothes, fit for a working-man, should be taken; enough to last a year, but no more. And I cannot caution persons too strongly on this point; the less taken the better, you are not hampered with useless things when you land. And, above all, take nothing for sale, it involves certain delay in getting your money, and almost certain loss. Take your money in cash, or, rather, send it out through the Union Bank of Australia.

Killerton, March, 1858.

4.—*Hints to the Young Farmer.* By ROBERT SMITH, of Exmoor.

THIS subject embraces a wide range of topics, which suggest themselves in the following:—

I. *Hints to the young farmer before entering upon a farm.*
II. *Hints on entering upon the farm.*
III. *Hints on the comparative periods of entry.*
IV. *Size and class of farm to be entered upon.*
V. *The plant: horses, carts, and implements.*
VI. *Probable amount of payment to the outgoing tenant.*
VII. *Estimate of produce. Green crops, seeds and grain.*
VIII. *Stock required for consumption of produce.*
IX. *Food consumed by cattle, sheep, and horses, with estimate of their increased value.*
X. *Estimate of capital required for an arable farm.*
XI. *Estimated annual outlay and return.*
XII. *Brief allusions to leading subjects.*

PART I.—HINTS TO THE YOUNG FARMER BEFORE ENTERING UPON A FARM.

The Farm.—The first consideration in a good selection of the farm is the character of the location. In making the selection it is necessary to attend to a variety of points, such as the climate, soil, subsoil, conformation of surface, markets, extent, buildings, roads, fields, tenure, rent, and outgoings.

These subjects, each of them important, require a separate notice.

Climate.—The climate of a farm should be well considered: it is one of the circumstances over which human art has least control. The tenant may improve the buildings, roads, and fences, but it is for the landlord to attempt the improvement of the climate.

In considering the climate of a district, the following points are of peculiar interest. Position, whether maritime or inland, its local heat, the prevailing winds, the regularity of the seasons, the productions best suited to it, expenses it may occasion in cultivation, and its suitableness for the introduction of new plants and animals.

The rain-gauge, the barometer, the thermometer, the hygrometer, and the vane should all be consulted.

Soil.—No general plan of farming can be laid down unless the nature and situation of the soil and subsoil be accurately known, but such is the force of habit, that many a farmer, who has been accustomed to only one description of soil, too frequently introduces *his* plants and customs to new occupations not at all suited to them, and even manures have been improperly applied, for want of attention to the soil.

The Chalk and Sandy Soils are not naturally valuable, but from their being so well calculated for sheep, easy of cultivation, responding quickly to the application of artificial manures, they are often farmed to advantage, and when of a good quality, and under a regular course of husbandry, they are invaluable.

Gravelly Soils, being porous, are generally poor and quickly exhausted, and are what is termed hungry. But crops upon these soils are usually early, and the climate around is even improved by additional warmth.

Clay Soils.—It is seldom that much profit is obtained from these, unless occupied with great spirit. Many of the best grazing lands rest upon clay—these can never be disturbed to advantage.

Loams are the most desirable of all soils to occupy. Some are moderately cohesive, others friable, &c.: these canbe cultivated at almost any season of the year, seldom require any change in the rotation adopted, and will grow any crop that may be planted upon them.

The Red Sandstone districts are alike valuable for every class of culture, and earlier in bringing the produce to harvest.

The Alluvial Soils, such as are formed from sediments of streams and decayed vegetables, are in general deep and fertile, and not apt to be injured by rain, as they usually lie upon a bed of gravel. From the great mass of excellent soil, the fertility of these tracts is nearly inexhaustible.

No general principle can be laid down for fixing the comparative value of soils; but it may be remarked that the soil alone is no safe criterion of the rent to be paid. Some rich soils involve much expense and risk in cultivation, while some poor soils have such a command of lasting manures, as lime or marl, or even of temporary manures, like sea-weed, refuse of fish, &c., as may render them profitable to cultivate.

The means of ascertaining the natural composition of soils, their improvement by manures or other soils, the keeping them in a fertile state, their changed temperature by drainage, or deep culture, the importance of colour, attraction of heat, decomposition of vegetable matter, and correcting agents, are alike subjects to be well understood, or studied by the intended occupier of a farm, whatever district he may select for his future lot.

Subsoil.—By examining the subsoil, information may be gathered as to the ultimate value of the soil itself. The hazard and expense of cultivating the surface are often considerably augmented by the defects in the under stratum, this, however, in some cases may be remedied by draining, subsoiling, &c. Retentive subsoils are highly injurious, they produce inferior grain and coarse grasses: a porous subsoil has the advantage of carrying off all superfluous moisture, and allowing the roots of crops to extend. Even a thin soil, with a favourable subsoil, will produce better crops than a fertile one on wet clay or non-absorbent rock.

The character of situation and surface in regard to farming lands, is again important in the occupation of a farm. A hilly, irregular surface is objectionable for every class of operation, and the best soil and manures on the steeps or declivities are not uncommonly washed away, whilst the sand and gravel remain.

Aspect has much to do with the profit of the farm, as it materially affects the quantity and quality of the produce.

Markets.—The facility afforded by an easy access to good markets, both in the sale of produce and the purchase of manures, form an important feature in the value of a farm, and must not be overlooked.

Size of Farm.—This decision ought to be governed by the extent of capital at command, as *no* recompense can be afforded to a tenant who engages more land than he can judiciously manage.

The difference of amount of capital employed per acre, in the several farming districts of England, is indeed surprising.

Farms of 100 acres are only suited to industrious families, as the profits of small farms are not sufficient to maintain an idle farmer.

However injurious it may be to the production of a numerous and healthy population of this order, large farms are on the increase, and will increase in the corn districts, in order to afford more suitable holdings for the present style of farming. The tenants thus liberated will be under the necessity of devoting themselves to other branches of industry, or of migrating to the more thinly populated districts.

Farms from 100 to 300 acres are best suited to the middle class of tenants; farms of this size, when mixed with meadow and pasture lands, are well calculated for the dairy system.

Mixed corn farms, ranging up to 500 acres, are ample occupations for any young man, for though possessed of capital, young men should not undertake too large a concern at first.

Large farms, ranging to 1000 acres and upwards, are usually occupied by experienced men of capital, talent, and enterprise, who use their occupation more in the character of a profession than otherwise, and conduct their every-day operations upon fixed principles.

The inducement to enlarge an occupation, is the saving of buildings and establishment charges, the comparative cheapness of land, the advantages of mechanical aid, the saving of horse and manual labour, the systematic employment of capital, and the consequent improved profits.

Tenure.—The landlord being the owner of the estate, naturally endeavours to make the most of it, but usually lets it for a number of years to persons of skill, industry, and capital, under certain covenants by lease or annual tenure: in this case the landlord is deeply interested in the welfare of his tenant, on which his income and prosperity materially depends.

The tenant, if a man of integrity, alike looks up to his landlord as a friend, whose interests are interwoven and inseparable with his own. It is thus essential that these interests should be established on just and liberal principles, so as to induce men of capital and enterprise to devote their attention to the art of agriculture.

Leases furnish the most beneficial species of encouragement to agricultural improvement—in fact, no great work can go on without these or some other equivalent securities.

The landlord has a fixed capital in the land, and the tenant a moveable capital consisting of his stock of knowledge, industry, and floating capital for the managing and stocking a farm. Thus situated, the parties are induced by prospective mutual advantage to unite their capitals; and their respective interests having been mutually considered, the agreement should constitute the terms or specific articles of the lease.

On this plain principle depends the healthy connexion between landlord and tenant. When liberally acted upon, both parties will be placed in a favourable position; but when departed from, the interest of the one, or perhaps both, must suffer in proportion to their deviation from that equitable line which at once unites and marks out their respective rights and obligations.

Short Leases are useless unless accompanied by a guarantee for improvements, as they scarcely carry a spirited farmer over more than one course of cropping, during which period he will have been making his investment by improvements.

In saying thus much in favour of leases, I do not mean to say that leases ought to be indiscriminately given to men who have not sufficient capital or intelligence to carry on improvements.

Covenants.—All leases should contain a few simple covenants, framed with a view to protect the property and the tenant from injury. But the chief features should be those for securing good cultivation at the *end of the term*, with a view to the progressive improvement of an estate.

Covenants which shackle the tenant unnecessarily cause irreparable loss to the community. Circumstances will of course vary the covenants of a lease; it is, however, desirable to have a form laid down for different estates; the agricultural clauses should be few, distinct, and simple. Leases thus drawn and printed would not be liable to much uncertainty or dispute; but some provision for settling disputes by arbitrators should be inserted in the lease itself.

In the selection of a farm it is well to consult an intelligent and experienced agriculturist, who would assist in pointing out the necessary improvements to be made, as also define those of a permanent nature, to be executed by the landlord, as well as those to be done by the tenant. Another person's independent judgment is a useful check on the too sanguine estimate we are all tempted to form of the probable success of plans of our own devising. This done, a separate memorandum may be signed, stating the parts to be executed by each, such as draining, fencing buildings, roads, reclaiming of wastes, suitable to that particular farm, as also any other conditions of a local nature.

Yearly Tenure.—There are indeed numerous instances of implicit confidence in the honour of noble families distinguished for hereditary virtues, and tenants have been induced to lay out immense sums of money on single farms simply upon yearly tenure; still, unless a tenant has a practical certainty of enjoying the land he occupies for a considerable period, he can have no real inducement to make any substantial improvements, while he has it in his power to injure the land he occupies. The difference between certain and uncertain tenure causes not only a marked difference in the value of land, but also in the tenant's facilities for raising capital. Yearly tenures with twelve or eighteen months' notice, and compensation for manures on quitting, is a better plan of agreement, and by no means objectionable, especially upon estates whose owners possess "hereditary virtues."

Rent.—There are various plans of renting land, such as corn-rents, mixed corn and fixed rents, fixed rents, and rents upon an advancing scale for inferior lands, that are let out at nominal rents at the commencement of a lease.

In hilly districts of the North, wool, or the price of wool for an average of years, is fixed on instead of corn, as being more in accordance with their produce.

It is not uncommon to blend corn rents with long leases, and it may be said to be an equitable practice, yet, a rent paid according to the annual price of corn is liable to serious objections, and can scarcely be advisable in a commercial country.

It is important to both parties, that the amount of rent should vary as little as possible from unforeseen causes.

The device of adopting a maximum and a minimum price in the range of a corn rent, is a good one, it being declared in the lease or agreement that the produce to be paid to the landlord, shall be converted into money, according to the current prices of the year, but that, to whatever extent prices may rise above the maximum price fixed upon, the landlord shall have no claim for such excess of price. By this plan the tenant is prevented paying any great excess of rent in scarce years, and to prevent the rent being improperly reduced in very plentiful years, the minimum price steps in, so that to whatever extent prices may sink below this limit, the landlord shall be entitled to receive this minimum price for the fixed quantity of produce payable to him.

The plan of a rent formed partly from the average prices of produce and partly of fixed money, is somewhat complicated in its arrangement, but has some advantages.

Fixed rents, under annual tenure or lease, are open to adjustment by the plan of allowances, such as comparative reductions by "per centages" upon the rentals, during depressed years, for the sale of agricultural produce.

The rent of land must always depend on a variety of circumstances, such as the wealth of the district, its population, price of produce, amount of public and other burdens, the distance from markets, the means of conveyance, the competition for farms—but the rent of any particular farm must be regulated by the nature of the soil, duration of the tenure, covenants in the lease, amount of capital required for its culture, and the expenses to which the tenant is liable for making improvements. The duration of tenure must naturally have a considerable effect in fixing the rent of poor land, which cannot possibly be even comparatively the same, as for fertile lands.

There are, indeed, a variety of miscellaneous questions to entertain before a prudent farmer will finally conclude a lease, viz.:—the nature of the property on which the farm is situated, the condition of the farm in regard to its present state, and apparent facilities for improvement. The social state of the farmers or others that would be considered as neighbours, the moral habits of the labouring classes and their comforts, parochial or otherwise, such as position with reference to village schools, places of worship, &c.

These details may appear tedious to recapitulate, but the young farmer or professional man, *on the look out for a farm*, may not be the worse for having his memory refreshed by them, and further—the party who intends to embrace farming as a pursuit should examine a little into his *own* disposition and talents, weigh his expectations carefully against ordinary results, and estimate justly the extent of business to which his capital may be adequate. When there is a deficiency of capital, the farmer cannot derive an adequate profit from his exertions. A farmer thus circumstanced would have to effect forced sales, whereby to realize at pressing periods, and would often be prevented making advantageous purchases when favorable opportunities occur.

II.—HINTS ON ENTERING UPON THE FARM.

Fixtures.—There is a difference as regards the custom of "taking fixtures." They are usually taken by valuation on entry, but ought properly to belong to the estate—especially, those that are contained within the residence, such as grates, cupboards, furnaces, &c. Such fixtures upon the farm, as are of a portable nature, should be subject to the approval of the incoming tenant, as to his taking them or not.

Much will depend upon the tenant he may have to follow. A man of spirit and affluence may have had his fixed engines, threshing machine, steamers, &c., all to *his* liking, but possibly not to that of the incoming tenant, who may be an equally good farmer, but may prefer the system of portable machinery.

Buildings, which come under the head of "fixtures," either are, or ought to be, under the control of the landlord, at the expiration of the term, who will have provided for this by private memorandum; possibly under a form of tenant right; if so, they should, at the change of tenancy, be paid for by the estate.

Improvements.—The custom of a graduated scale of payment for improvements effected by the outgoing tenant, and received by the incoming tenant, is a good and equitable plan for all parties concerned.

Under this arrangement, the landlord gets a well managed estate, the incoming tenant enters upon a rent-paying farm, and the outgoing tenant receives his proper return for the capital he leaves behind him.

It is worthy of notice that upon such estates no difficulty of tenancy exists, but, that the competition for these farms increases, as the healthy tone of their covenants become known and understood.

Hay, Straw, Manures, &c.—The terms upon which the straw and manure is taken is usually decided by custom. Not so with the hay, unless specially stipulated; this stipulation, like many others, requires a safeguard, or the outgoing tenant may be induced so to look about him as to make *a bill* not very acceptable to the incoming tenant.

Manure.—The payment for manure is a local matter: in some places custom requires that it should be taken at a valuation, in others that it shall be used in due course, and that any remaining heaps shall be the property of the incoming tenant, by his paying the cost of all labour that may have been expended upon them.

The straw grown upon an acre of land, under average yield, is calculated to produce four loads of dung, but then the substances that may have been incorporated with it during the period of its conversion, must be taken into account.

The quality of manure may in some measure be come at by ascertaining the number of cattle that have been fed upon it, and the quantity and quality of food consumed.

Farm-yard dung may be estimated by measurement, the same as hay. In this case it requires to be thrown up at the ends and sides into square work: the length and breadth is then taken by a tape, and the depth by an iron rod.

If fermentation is going on, the heap will continue to settle; in this case, allowance by the deduction of one-third or one-fourth must be made for future diminution, according to quality.

We will, for illustration, suppose a case. That a dung-heap is 40 feet in length, 20 feet in width, and 4 feet in depth. The minimum quality of the manure being equal to 4*s.* per yard.

Thus: 40 × 20 = 800 × 4 = 3200 square feet or 118 yards, 14 feet, at 4*s.*, 23*l.* 4*s.*

40 cubic feet, or 1½ yard of solid dung, is a substantial load.

The price usually paid for ordinary farmyard manure, that has been carted to a heap, is from 3*s.* to 4*s.* per load, equal to 2*s.* to 2*s.* 9*d.* per yard. This is full low for good manure.

III.—Hints on the Periods of Entry.

The early history and practices of our island clearly show that the customs of our forefathers were established upon practical views, and that the character of soil to be dealt with very naturally governed their period of entries upon lands that were newly taken in hand, and thus led to certain practices peculiar to each district. Amongst them the ancient usage of entering upon farming lands at certain fixed periods of the year. These usages have been handed down to us, through successive generations, remodelled on their way, and now form the basis of our present customs.

It would appear from early evidence, and the then desire for lands suitable to the growth of rye and wheat, that an autumn entry had been more generally adopted, as being the most convenient period for the sowing of these crops, and the abandonment of other lands that had just previously yielded its golden crop to the scythe. This is supported by the present custom of Autumn rubrics, upon the oldest wheat-growing districts.

Autumn Entries.—The Autumn entry usually takes place at New Michaelmas, 29th September. But in some districts it is the practice to enter at Old Michaelmas—10th October. There are also Martinmas entries, 22nd November.

With Autumn entries, the tenant takes to the land and houses together. This affords him the opportunity of sowing his own wheat and vetches, ploughing his winter fallows, and making other preparations for the Spring. The outgoing tenant retains the barns, for threshing his corn, and the yards for the consumption of his straw, &c., unless the incoming tenant takes them by valuation.

This latter practice is objectionable, and has been revised in some districts, by an arrangement being entered into for the incoming tenant to take the hay and straw at a valuation, and with them he gets the use of the yards. As a convenient set-off against these payments, he agrees to pay for the threshing of the corn, and carts it to market, &c., a distance not exceeding the usual custom —say 10 miles,—by far the best mode.

By this arrangement, both parties, to a certain extent, are benefited. The outgoing tenant gets clear out of his old occupation (except the selling of his corn), and is set at liberty to remove to another farm; the incoming tenant has full use of the yards, hay, straw, &c., and makes his own manure.

The farm valuations are made some few days previous to the day of entry.

The root crops are valued, either by their apparent worth, according to the season's price, or by their cost in production, rents, rates, manure, and tillages.

The valuations made for *summer* fallows on tenacious soils vary materially—in fact, every district appears to have its custom. The common sense view being that of valuing every required or proper act of husbandry, that has been *efficiently* performed upon the land since the removal of the preceding corn crop, as also the rent, rates, &c., that have been paid upon them.*

The cost of the last year's clover and grass seed bill is paid in every district, according to the (merchant's) bill produced.

The cost of sowing the grass seeds is always allowed for.

The advantages of the preceding plan of an Autumn entry are that it is calculated to simplify the process of Autumn valuations upon changing tenants, that the cultivation of the farm during the ensuing season is amply provided for, the incoming tenant enters upon tolerable terms, and the outgoing tenant is set free (or nearly so) to arrange his new occupation.

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* It is very important that the basis of this arrangement should be so laid, that an outgoing tenant is not to be better paid for bad farming than for good. As long as the turnips are abundant and clean, what matters it to the incoming tenant how cheaply they were produced? he ought to pay their fair worth to consume on the premises, and certainly ought not to pay for five ploughings, when one would do as well if done at the right time.—ED.

The disadvantage of an Autumn entry, to an incoming tenant, is the long period of suspense before any return can be made for carrying on the subsequent payments of rent, rates, housekeeping, labour, &c. And to the outgoing tenant, the having his corn threshed in a distant barn amongst the incoming tenant's labourers, and carted to market by another man's servants. Such is custom—as a tenant enters, so he must quit.

Spring entries.—The next ancient custom is the Candlemas-day entry, 2nd February. This period is still adopted in many districts, especially in the North, where they enter to the lands on Candlemas-day, and to the house and yards on 13th May.

The offgoing tenant allows stabling for six or more cart-horses, as the case may be.

The advantage of this entry is the facility it gives the incoming tenant for sowing his Spring corn. The wheat crop is taken by the incoming tenant. The rent and rates up to the period of entry, cost of seed and tillages, form the basis of valuation. With this entry there is no valuation for corn or hay, beyond the wish of the incoming tenant.

The chief disadvantage is that of the two tenants having their homes at distant places during this busy period of the year, the incoming tenant not having full possession of the premises at the same time, and the constant annoyance of two sets of labourers being upon the same ground—to say nothing of the clashing of interests between two opposing parties—the outgoing and incoming tenant.

With the introduction of the turnip crop, a new era sprang up, which brought the light soils into more general notice as an employment for capital and the growth of roots. This subsequently led to the four-course system of cropping. The turnip culture being the preparatory step for the succeeding barley, seed, and wheat crops.

The period of cultivation for the turnip being in early Spring, it led to the occupation of many new lands at that season of the year, and with it grew up the extended desire for Spring entries, Lady-day. New Lady-day, 25th March, and old Lady-day, 6th April, are each adopted; according to the custom of the district.

With a new Lady-day entry, a confusion in the Spring seeding is experienced, it being just the busy season for sowing the barley, &c., and the roots and straw will scarcely have been consumed.

Therefore, unless some arrangement is entered into (as in the case of the Candlemas entry) for stabling an efficient number of cart-horses for the incoming tenant to get established, and prepare for the sowing of his crops, this period of entry is objectionable. *Old Lady-day* is a more favourite time of Spring entry, and appears to be gaining strength. With it every part of the land, house and offices, are entered upon at the same time. A valuation is agreed upon for all previous acts of husbandry. This simplifies the entry to a small and convenient compass.

The advantages of an old Lady-day entry are many. The WINTER is then *over*, the roots are all consumed, and the *straw* made into *manure*. The yards, barns, and granaries are all clear, the cattle and fat sheep sold without a valuation. All the grain crops will have been *sown*, and the *winter fallows polughed up ready* to receive their preparation for roots. These are great *facilities* on entering upon a strange farm.*

It may be said that such an entry is indeed perfection, save the heavy valuation of tillages—in effect, that the incoming tenant should plant his own Spring crops. If we consider the two positions of the two parties for accomplishing these acts of husbandry, it will be seen that they could not have been performed at a cheaper rate, than by a proper agreement, for valuation, &c., with the outgoing tenant.

The sowing of the wheat crop is the question now to be entertained, and if this be done by the outgoing tenant, upon the agreement that he is to be fairly paid for his tillages, half a year's rent and rates, seed wheat, &c., there can be no doubt as to the value of a Spring entry.

With either of the Autumn entries we have a risk of a mixed tenancy, and consequent clashing of interests, and very probably the two tenants may both have two holdings, possibly wide apart, for three or four months of the dreary period of the year. The main difficulties to be overcome are the consumption and sale of the last year's produce, and preparation of the land that falls to be cultivated for the next crops.

The processes upon a farm are so mixed, that it would be difficult to name the time of year when no difficulties exist. So that the great object to be attained is that of changing the occupation in such a manner that it may suit the tillages of the farm, and give the old tenant a clearance of his farm produce without valuation or interruption before the new tenant enters upon the premises. To give the incoming tenant FULL possession at the same time, free of valuations beyond the tillages; and for every operation of the farm to be *properly carried on* (until a fixed period) by the outgoing tenant.

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* It must be allowed that to enumerate these points as advantages, is to presume much goodwill, and zeal for another man's interest, on the part of the outgoer.

Under all circumstances, I prefer a *Spring entry* at old Lady-day, especially for young farmers. With a Spring entry we get the full benefit of the summer's growth before us, to reinstate our outlay at an earlier period, and provide for the forthcoming rent-day.

To aid and give simplicity to the plan of Spring entries I subjoin a few suggestions, which may be useful towards establishing an amicable system.

1. That the outgoing tenant shall perform every required operation upon the farm up to a fixed period in the Spring (Lady-day or Candlemas) on being paid for these acts of husbandry.
2. That the outgoing tenant shall farm the lands upon the usual plans of husbandry up to the said period of his quitting, under certain forfeitures.
3. That a proper allowance for crops and manure in or on the ground be made him according to agreement.
4. That the outgoing tenant shall be paid half-a-year's rent, rates and taxes, upon all land sown with wheat, in addition to the usual allowances for seed and tillages.
5. That the outgoing tenant shall first offer his farm implements to the incoming tenant, by valuation, before proceeding to a sale by auction.
6. That all fixtures be subject to agreement between the outgoing and incoming tenant; unless paid for by the estate.

IV.—SIZE AND CLASS OF FARM TO BE ENTERED UPON, COURSE OF CROPPING, &c.

It is difficult to determine upon a class of farm which shall represent the required information.

I take it the better plan is to select an *arable* farm of average quality, in what is provincially termed an *arable* district, farmed upon sound principles. These have been most susceptible of modern improvements.

For the convenience of our subject we will assume:—

1. That the farm is to be entered upon in the Spring—6th April—and that the plan of entry just previously suggested is to be the one adopted.
2. That the farm shall contain 400 acres of arable land.
3. That it is farmed upon the four-field course of husbandry.
4. That the rotation be green crops, barley, seeds, wheat.
5. That a breeding flock of sheep is kept, that cattle are pur-

chased in October for the yards, and that "the team" is kept in the stable (or nearly so) throughout the year.

This will form a basis for comparative calculation, and best illustrate our purpose of "Hints to the young farmer."

V.—THE PLANT: HORSES, CARTS, AND IMPLEMENTS.

Horses.—The average class of lands cultivated under the four-field course of husbandry are such as can be ploughed by a pair of horses. The work of the farm performed by one-horse carts, and implements of medium strength.

Previous to the introduction of improved implements and machinery, the usual estimate was one pair of horses to every fifty acres of land. Since these facilities have been afforded, much has been done to rescue the farm-horse from his more laborious duties of the farm.

Each pair of horses will now readily cultivate sixty acres of land.

As the farms increase in size, and with them the number of horses, great additional strength is given to the farm by the concentration of numbers upon any particular occasion when horse-labour is most pressing.

By this unity of strength the horse-labour of a farm is materially affected, and it may be written, including the new plan of autumn-cleaning, that seven pairs of farm-horses will be found more than ample for the 400 acres of land now under discussion.

Carts.—With regard to carts we must assume that the fields are of average distances from the homestead. In this case eight one-horse carts, with moveable raves or bodies for harvest work, will be required. In addition to these, one substantial (but not heavy) waggon should be kept for marketing the corn, and some few other purposes on the farm.

Machinery.—In conjunction with this extent of farm, a doubt may arise as to the class of machinery to be used, and as to whether a fixed steam-engine could not be erected with economy for general purposes.

This question is open to considerable discussion. Some eager improvers will advocate its use, and support their case by an appeal to the economy of concentration. Others, who are not so sanguine as to the paying results of such outlays, support their views by hiring a portable steam threshing-machine at suitable periods, rather than find the money for a fixed outlay.

Possibly the best and most convenient course for the average of our tenant farmers, and one which does not lock up much money, is that of some few neighbours purchasing a portable steam threshing-machine between them. By this plan every facility of use would be afforded, and the machine might be let out to the smaller farmers, and thus afford a sufficient income for repairs and interest of capital.

With a view to full information as to the sort and number of modern implements required upon a 400 and 200-acre farm, I subjoin a tabular statement, compiled from an essay written by Mr. Allen Ransome.

TABLE I.

Implements to be provided.

	400-acre farm.	200-acre farm.
One-horse carts, with harvest raves	8	6
Waggons	1	1
Common ploughs	7	4
Broadshare ploughs	1	1
Clarke's universal plough, with horse hoes	2	1
Biddell's cultivator, or Coleman's drag	1	1
Clod crusher	1	1
Manure and seed drills	1	1
Common drills for flat work and for ridges	2	2
Rollers—light and heavy	2	2
Common harrows, different sets	5	4
Garrett's horse-hoes	1	0
Turnip cutters	3	2
Cake breakers	1	1
Bean and corn mills	1	1
Weighing machine	1	1
Horse drag rake	1	1
Dressing machines	1	1
Threshing machines—doubtful	0	0
Horse-power chaff machines	1	1
Water cart	1	1

The minor Implements upon a farm, such as forks, rakes, spades, draining tools, &c., are scarcely worth a formal notice.

By the above inventory of implements, it is clearly shown, that this branch of investment upon a farm, requires the greatest attention, in selection and outlay. Otherwise the implements upon a farm will not only be increased in cost by inattention, but of less practical value by improper selection. Hence, the trial of certain implements, before purchase, is found both essential and instrumental in doing good service to the purchaser.

The following calculations are grounded upon a farm already in first-rate order, and composed of a *superior turnip soil;* every departure from this quality of soil and class of farming will alter the calculations accordingly:—

VI.—PROBABLE AMOUNT OF PAYMENT TO THE OUTGOING TENANT.

TABLE II.

	£	s.	d.
Grass seed bill of previous year, 100 acres at 13*s*. per acre	65	0	0
Cost of sowing the same, at 2*s*. per acre	10	0	0
Cost of sowing 100 acres of wheat, at 43*s*.	215	0	0
Half-year's rent, and rates on the above at 17*s*. 6*d*.	87	10	0
Cost of sowing 100 acres of barley, at 32*s*.	160	0	0
Cleaning 100 acres of autumn stubbles, at 10*s*.	50	0	0
Carriage of 1000 loads of dung to certain stations, at 6*d*.	25	0	0
Compensation for unexhausted manures, used during the last three years (see future statement) upon the turnip lands (as per Lincolnshire custom)	225	0	0
Half the oil-cake bills, as benefit to the farmyard dung, when given to cattle [see future statement]	185	12	6
Compensation for share of permanent improvements	70	0	0
Sundry items not mentioned	100	0	0
	£1193	2	6

VII.—ESTIMATE OF PRODUCE. ROOTS, GREEN CROPS, SEEDS AND GRAIN.

With this class and extent of farm, the following proportions will occur, viz. :—

TABLE III.

	Acres.	Acres.
Acreage.—First Year.—Roots and green crops :—		
Requirements for the Horses—Green crops for soiling	10	
Carrots	1	
„ Cattle—Mangel wurzel	14	
Turnips	10	
„ Sheep—Turnips	60	
Cabbages	5	
		100
Second Year.—Spring corn :—		
For Horses—Oats for the year's consumption	25	
Grain, barley, seeded	75	
		100
Third Year.—Clover or mixed seeds :—		
For Horses and Cows—Clover, hay	20	
„ Sheep—Seeds, for grazing	80	
		100
Fourth Year—Autumn wheat		100
		400

Produce.—First year.—Green crops and roots :—

For the team of 16 horses, we require 10 acres of winter and spring sown vetches, rye, &c. The average weight of good green

crops for soiling is 9 tons 15 cwt. per acre. These succulent crops lose three-fourths their weight in drying. This gives 2 tons 8¾ cwt. per acre when dried and made into hay.

			Tons.	Cwt.
Green crops ..	10	acres, if made into hay, 2 tons 8¾ cwt. per acre	24	7½
Carrots	1	„ for the young horses, &c., ...	20	0
Mangel wurzel	14	„ at 25 tons per acre	350	0
Turnips	70	„ „ 17 „ „	1200	0
Cabbages ..	5	„ „ 30 „ „	150	0
	A. 100	Tons	1744	7½

Second Year—Barley and oats, seeded:—

Barley ..	75	acres at 5½ quarters per acre	412	4
Oats ..	25	„ „ 7¼ „ „	181	2
	100	Qrs.	593	6

			Tons.
Third Year—	20	acres, clover hay, at 2 tons	40
	20	„ after grass, at 1 ton	20
	80	„ summering ground, say 3 tons ..	240
			300

Fourth Year—100 acres, autumn wheat, at 4 quarters per acre, 400 quarters.

VIII.—STOCK REQUIRED FOR CONSUMPTION OF PRODUCE.

TABLE IV.

	Tons.	Cwt.
Estimate of produce and consumption of the 1st and 3rd years' green crops:—		
First year.—10 acres of rye and vetches, vetches, &c.	97	10
The 16 horses will require clover hay during two-thirds of the year, and green food the remaining one-third of the year. We have thus 122 days to provide for; each horse will consume 1 cwt. of green food per day.		
16 horses, 122 days, at 1 cwt. per day, or 6 tons 2 cwt. per horse	97	12
Carrots—these to be consumed by the young horses, &c... ..	20	0
Mangel wurzel and turnips for the yards.		

It is essential to have early made farmyard manure: for this purpose the cattle may be placed in the yards as early as the 1st of October, and remain until the 1st of April—27 weeks.

	Tons.	Tons.
14 acres of mangel, at 25 tons per acre	350	
10 acres of turnips, at 20 tons per acre	200	
		550

For the convenience of figures, we give a *stipulated* allowance of roots for the 27 weeks as under:—

	Tons.	Tons.
110 head of cattle, 10 weeks upon turnips, at 60 lb. per day ..	200	
110 head of cattle, 17 weeks upon mangel, at 60 lb. per day ..	350	
	——	550
Cabbages to be eaten by sheep—5 acres of cabbages at 30 tons per acre	..	150
Sheep—240 lamb-hogs and 80 draft ewes, from 1st August to 1st October—60 days, at 14 lbs. each per day	120	
Ewes and lambs in the spring, the remaining one acre of spring cabbages	30	
	——	150
Turnips to be consumed upon the land by sheep. 60 acres, at 17 tons per acre, or equal to	..	1000
Sheep—240 lamb-hogs, 80 draft ewes, or wether sheep, for fatting, 240 breeding ewes, 560 sheep (from 1st October), 26 weeks, at 22 lb. each sheep per day, equal to	..	1000

This gives 10 sheep per acre for 25 weeks, or 12½ for 20 weeks.

		Tons. Cwt.
Third year—Clover, or mixed seeds:—		
Clover hay, 20 acres, at 2 tons per acre		40 0
Horses—16 horses, two-thirds of the year, or 243 days, at 20 lb. each horse per day	34 5½	
Cows—4 dairy cows, 24 weeks, or 168 days, at 20 lb. each per day	6 0	
	——	40 5½

	£	s.	d.	£	s.	d.
Clover eddish, 20 acres, worth 20s. per acre	20	0	0	20	0	0
Half eat by 40 sheep, and half charged to the cows	20	0	0	20	0	0

Sheep—80 acres of seeds for summering ground, at 60s.				240	0	0
These will graze 240 ewes and lambs, and 80 ewe-hogs for 26 weeks, at 6*d*. per head per week	208	0	0			
200 lambs 8 weeks, from 5th June to 1st August, at 4½ per head per week	30	0	0			
				238	0	0

IX.—ABSTRACT ACCOUNTS OF THE VALUE AND QUANTITY OF FOOD CONSUMED BY CATTLE, SHEEP AND HORSES, WITH ESTIMATE OF THEIR INCREASED VALUE.

TABLE V.

Amount and value of food consumed.

CATTLE: Winter half-year.

	£	s.	d.
Turnips, 10 acres, 200 tons .. Mangel wurzel, 14 acres, 350 tons } 550 tons at 9s.	247	10	0
Straw 170 acres, barley and wheat straw (with roots)	50	0	0
30 „ converted into other uses, thatch and stable litter			
200	297	10	0
Wintering of 110 beast, 27 weeks, on 60 lb. roots and straw per day, at 2s. per week, 297*l*.	297	0	0

	£	s.	d.
If oil-cake is given at the average rate of 4 lb. per day, turnips and mangel wurzel as above	247	10	0
Straw, 170 acres barley and wheat straw (with roots and cake) ..	50	0	0
110 beast, 4 lb. of cake per day, at 10*l.* per ton, 371*l.* 5*s.*, half the oil-cake bill charged to the cattle and half to the manure ..	185	12	6
	483	2	6
110 feeding beast, 27 weeks, on 60 lbs. of roots and 4 lb. of oil-cake per day (on an average for the season), at 3*s.* 3*d.* per week	482	12	6

Cost and estimated return.

	£	s.	d.
110 beast to winter, for grazing next summer	1400	0	0
Cost of wintering on roots and straw	297	10	0
	1697	10	0
110 beast for grazing, at 15*l.* 8*s.* 6*d.*	1696	15	0
110 beast for feeding in the yards, &c., cost	1400	0	0
Wintering on roots, cake, and straw	483	2	6
	1883	2	6
110 fat beast, 50 stone each, at 7*s.* per stone (less expenses to market, &c., 7*s.* 6*d.* each)	1883	15	0

Amount and value of food consumed, &c. &c.

SHEEP :—	£	s.	d.
Seeds—80 acres of seeds for summer grazing, at 60*s.*	240	0	0
Clover eddish, 20 acres (half for the sheep)	10	0	0
Cabbages—4 acres of winter, and 1 of spring cabbages, at 8*l.* ..	40	0	0
Turnips—70 acres of turnips (say 1000 tons, at 6*s.* 9*d.*)	337	10	0
Use of 3 rams for the season	25	0	0
Losses upon general flock, at 4 per cent.	40	0	0
	692	10	0

Amounts received.

	£	s.	d.	£	s.	d.
By sale of 120 wether hogs (without corn) at 40*s.*	240	0	0			
" " 40 draft gimmers, at 40*s.*	80	0	0			
" " 80 draft ewes, fat, at 40*s.*	160	0	0			
" wool, 140 tods, at 30*s.* per tod	210	0	0			
				690	0	0

TABLE VI.

Abstract account of the cost of maintaining the team of sixteen Horses.

	Tons.	Cwt.		£	s.	d.
Clover hay, 17 acres, or consumed ..	34	5½	at 50*s.*	85	12	6
Vetches, &c., 10 acres, equal to (if dried)	24	8	at 40*s.*	48	16	0
Carrots, 1 acre (part given to young horses)	20	0	at 15*s.*	15	0	0
Oats, 25 acres, 58 bushels per acre—equal to 1 peck per horse per day (11 st. net)	24	18½	at 2*s.* 6*d.* per bl.	181	5	0
Tons	103	12		330	13	6

Average weight of food per horse per day, 39 lb.

Average cost of food per horse, per week, 8*s.* upon the produce of the farm, at *farm* price.

X.—ESTIMATE OF CAPITAL REQUIRED FOR AN ARABLE FARM OF 400 ACRES.

TABLE VII.

	£	s.	d.
Tenant right and valuations on entering at Ladyday	1193	2	6
6 pairs of substantial farm horses	400	0	0
1 pair of cart colts, and 1 pair of riding or job horses	100	0	0
Implements of husbandry and horse harness, at 20*s.* per acre	400	0	0
Sheep—240 ewes and lambs, at 50*s.*	600	0	0
80 ewe hogs, at 45*s.*	180	0	0
Rams, pigs, and poultry	60	0	0
3 or 4 dairy cows	60	0	0
Household furniture, &c.	300	0	0
Cash required for housekeeping, labourers, &c.	400	0	0
	3693	2	6
110 beast for the yards, during the winter season	1400	0	0
	5093	2	6

This estimate gives 9*l.* 5*s.* per acre before harvest, and 12*l.* 15*s.* for the winter.

XI.—ESTIMATED ANNUAL OUTLAY AND RETURN—400-ACRE FARM.

TABLE VIII.

	£	s.	d.
Rent, parochial and other fixed payments, 35*s.* per acre	700	0	0
Labour of every order upon the farm, 35*s.* per acre	700	0	0
Hire or use of machinery for threshing, &c.	25	0	0
Tradesmen's bills upon the farm	80	0	0
Wear and tear of implements	50	0	0
Manures, artificial manures for 100 acres of fallows, at 25*s.*	125	0	0
Artificial manures for certain wheat-fields, 20 acres at 25*s.*	25	0	0
Oil-cake bill (half repaid by cattle and half charged to farm-yard manure)	371	5	0
Grass seeds—mixed clover seeds for 100 acres at 13*s.*	65	0	0
Seed wheat—100 acres of wheat, 2½ b. per acre, at 7*s.* 6*d.*	93	15	0
Barley— 75 „ barley 4 b. „ 4*s.* 6*d.*	62	10	0
Oats 25 „ oats 5 b. „ 3*s.* 6*d.*	21	17	6
Green crops 10 „ vetches, &c. 4 b. per acre at 7*s.*	14	0	0
Small seeds—turnip, mangel, cabbage and carrot seed, 100 at 2*s.* 6*d.*	12	10	0
Use of rams, and other males	30	0	0
Horses—Keep of 16 horses, at an average of 8*s.* per week, 52 weeks	334	16	0
Interest of capital, insurance, &c., on 4000*l.* (12 per cent.)	484	12	9
	3195	6	8

TABLE IX.

Estimated receipt upon four hundred acres.

		£	s.	d.
Corn—	100 acres of wheat, 4 quarters per acre, at 52s.	1040	0	0
	75 „ barley 5½ „ „ „ 30s.	618	15	0
	25 „ oats 7½ „ „ „ 20s. (horses)	181	5	0
Green crops 100 acres	Turnips, amount made by sheep	337	6	3
	Cabbages „ „ „	40	0	0
	Turnips „ „ cattle Mangel wurzel „ „	247	10	0
	Green crops „ „ horses	50	0	0
	Carrots „ „ „	15	0	0
Seeds—	Clover hay „ „ „	85	12	6
	Clover, hay, and seeds, amount made by cows	30	0	0
	Summering ground „ „ sheep	240	0	0
Straw—	170 acres of barley and wheat straw—cattle	74	5	0
Oil-cake—	Half the oil-cake bill—by cattle account	185	12	6
Pigs—	By feed in the yards, &c.	50	0	0
		3195	6	3

The limits of space allotted to this class of essay will not admit of detailed accounts of our preceding tables. In reviewing the calculations, it must therefore be strictly borne in mind, that they are founded upon a particular class of farm, course of cropping, soil and management. Any deviation from these plans will naturally disarrange the whole. Yet enough may have been written to give suggestions for other calculations, applicable to different farms and farming. For instance, some tenants prefer breeding everything, or perhaps half the stock they own; others purchase everything, or part. Some choose an entire *feeding* stock, that they may supply artificial food to them, to improve the farm.

The slightest variation of the green crops, and their consumption, would at once change the whole system and figures here given: for instance, the clover and mixed seeds may be grazed or mown. The fallows may be sown with turnips or coleseed, to be *fed upon the land;* or half the roots may be drawn and artificial food given to the sheep on the turnips.

A tenant may choose to sell hay, straw, or roots, and purchase manures. Another may give straw and clover hay to his cattle in the yards, or give them straw only, or oil-cake and straw. Some may have a fancy for keeping a number of pigs in the yards, and supply them with artificial food, in the place of cattle or half the number of cattle, and so on.

The above sketch is drawn, to show how difficult it is at all times to arrive at *certain* data for agricultural calculations—but in no case is it more so than in the present, viz.:—That of estimating farm produce, its cost and consumption upon a single farm.

Farms that have been too liberally treated by what is termed "high farming" upon the *four-course system* we have selected, as being the best illustration of modern practice, have become even too good, and induce the remark, that "high farming has its limit."

The system of forcing roots to their utmost growth by artificial manures has had a perceptible effect upon the succeeding barley crop. In place of the required "stiff straw" and heavy corn, we have the barley *lodged*, and, as a consequence, get in return inferior grain, inferior straw, and inferior seeds in the barley crop. If we are to have this excess of richness poured into the soil, as undoubtedly we must have, it is quite certain that upon all the deep rich loams and many others we must have a *new* "course of cropping" to meet this altered state of things. If parties do not like to change their accustomed course, and to disarrange their fields, it may be advantageous to sow the richer lands with spring wheat, and the other with barley.

There are two plans of a *five-field course* that may be mentioned, viz., turnips, barley, barley seeded, seeds, wheat; turnips, part wheat and part barley (according to goodness), each seeded, seeds, wheat, barley.

In either of the above cases there can be no doubt as to the improved quality of the grain. With the increased weight of our root crops we have certainly created a difficulty as regards the growth of corn; not so with the extension of our flocks. Sheep are ever valuable—they tread our soil mechanically, they convert our roots into money value, and thus become the turning-point of good and profitable husbandry. But they cannot make the barley stand erect, or even maintain itself in a respectable position—they have indeed helped to aid its intoxication! If this be a true picture, and doubtless it is so, we have thus early in our agricultural progress arrived at a supposed "*limit for high farming.*" This may be true as regards corn and present cropping—but I demur to the statement. There is yet a rescue from the present dilemma by the introduction of a *new* (and possibly novel) five-field course of cropping, viz.:—

1. Turnips and green crops.
2. Rape and young seeds, without corn.
3. Seeds, grazed or mown.
4. Wheat.
5. Barley.

The first year.—By the adoption of this course we have no pressure in the early eating of the turnip crop for barley; and in the place of a thin smothered seed crop we have a succeeding thick and excessively verdant crop of rape and young grass for fattening any description of sheep.

The second and third year.—The seeds will also be comparatively good, in consequence of their having been sown without a corn crop, as also because the rape and grass will have been consumed upon the land, instead of a crop of barley being grown to impoverish it.

The fourth year, the land will be sown with wheat, when it cannot well be too rich for this plant.

Fifth year, we have a barley crop after the wheat has taken something out of the land, and it will now be found to grow an excellent crop both in quantity and quality.

By the extension of the four-field course into the above plan of a *five-field course*, we have reduced the average of each rotation one fifth; from 100 to 80 acres.

By this new course the following results suggest themselves, which I now offer for full consideration.

We have reduced the labour account and bills, increased the pasturage for an extended flock, have produced a greater space between the root crops, a convenience in their consumption, nearly doubled the average value of our seeds for fattening purposes, produced a safer plan of cropping, the average value of which far exceeds that of the four-course plan, and lastly we have conquered the freaks of our barley crop, and saved our plant of seeds.

The above suggestions are given with a view to meeting the particular and growing defect in the four-course system of husbandry. But they are open to adoption on any land—rich or poor.

XII.—BRIEF ALLUSIONS TO LEADING SUBJECTS.

Contract Work.—The usual operations of ploughing, harrowing, &c. &c., are performed by day labour, but the cases in which task work is applicable are on the increase; where these occur, the carter has charge of two pair of horses or oxen, which are changed during the day. The work is performed by the acre. The carriage of manure, soil, compost, &c., may also be done by contract, according to weight and distance, as is commonly done in the filling and spreading of these substances.

The harvesting of corn by contract is fast growing into practice, especially where despatch and economy prevail. These elements, with the aid of a growing desire for extended contract work, will quickly define the class of implements best adapted to present uses, and go far to define the margin between horse and manual labour, as also between horse, steam, and water power.

The farmer who contracts for his work, naturally improves in talent:—as a rule, every operation should be performed by contract, except where the management of stock is concerned.

The Team.—There are three plans of establishing and maintaining a team. First, To keep an extra number of mares as a breeding stock, in conjunction with the farm work. In this case, the young mares, and such as happen to be barren, perform the heavier work, and the brood mares the lighter work. This class of team is best suited to the easy working farms, and such as have a good proportion of pasture land. Second. To keep a comparatively young and healthy team of horses, by the annual introduction of two years' old colts, to replace the usual draft of older horses, at, say six or seven years old. The drafts so made are sold as "worked horses" for the London or other drays,—they fetch, in most cases, high prices. Third. To keep a mixed team of all sorts and ages, to be (what is provincially termed) "worked out." This team is only replenished as the "old ones" drop off. This may be a convenient low-priced team, but I much doubt the policy and profit.

Manures.—Every farmer has *his* plans of making and preserving farm-yard manure; whether in open yards, yards with sheds, boxes, stalls, or covered yards. The old plan of making "strawyard" manure has happily given way to commerce. Practice has shown the whole operation to be "one of straw." The value of the manure, the cattle, the farmer, the farm, and even (to a great extent) the land being dependent upon this strawyard process. How different the results under the care-taking pains of the man who feeds his cattle well, and husbands his resources by attention and system. Solidity is the mainstay to the preservation of farm-yard manure. Chopped straw for litter is a convenient and excellent practice.

It certainly becomes a farmer to look commercially into the raw materials about him, and see how far he can economize and improve the *manufacture* of his own farm-yard manure, before he spends ready cash in the purchase of an "artificial," with the intrinsic value of which he himself is seldom acquainted except by report.

A manure house is an essential building upon every farm, for the reception of all refuse substances fit for manures. This house also supplies convenience for the manufacture of home made artificials, such as superphosphate, &c. Half-inch bones are found best for dissolving. Mixture for one acre:—

42 lbs. or 1 bushel of bones—17½ lbs. of acid—9 lbs. of water and 10 bushels of ashes. The bones to be sprinkled with water before the acid is employed.

The uses of artificial manures are becoming familiar in practice. The value of these portable manures is possibly best shown by their use for distant and hilly lands, where the carting of farm manure, and the chances of a root crop, would be equally impracticable. As top-dressings for grass lands, especially hill sides, they are becoming invaluable.

Root Crops.—Every farmer knows how to grow roots, but the preservation of turnips, when grown, has of late been a more troublesome subject—disease has beset them in many forms. This may arise from the bulb being too rapidly forced, or from the land being too frequently cropped with the same plant—under the four-course husbandry. As a partial relief to this disappointment the Drumhead cabbage and mangold wurtzel may be extended in growth.

The Cattle cabbage has not received the attention due to it,—possibly in consequence of the difficulty and cost of procuring "winter" grown plants. This may be obviated by the farmer sowing his own seed: about the 12th August is the proper time. Young seedlings should be transplanted from the seed bed for the winter season, and then planted upon the prepared fallows from April to June.

Their portable uses are innumerable. Ridges, full 3 ft. wide, are found to produce the heaviest crops. If a handful of artificial manure be thrown in with the plant (in addition to the usual dressing of farm-yard manure) so much the better; it ensures their growth, even in dry seasons.

Mangold wurtzel has grown so rapidly into use, that a passing remark may alone be sufficient upon this subject. No man of business on an arable farm should be without it: it has hitherto been free from disease.

Irrigation.—Water meadows are easily formed and easily managed, and are most sure in their return.

The profit of applying artificial manures in solution to the meadows, as also the theory of the action and fertilizing properties of the water upon the transformation of the grasses, are questions yet to be decided.

Some demur to the mixing of artificial manures with the water; they affirm, that the manures become so far incorporated with the water, that they cannot be separated again, and are consequently carried away to the brook, in solution.

The Leisure Hour.—To use the words of the late Arthur Young, "July is the month for the young farmer to look about him—to see other farms and farming." To this, it is our province to add, take a trip to the annual agricultural gathering of our Society, to see other "stock and implements." Read the Society's Journals during leisure hours; and lastly, *subscribe liberally* to the Society's funds, that the officers may carry on the bold and substantial work they have before them.

Winter evenings are the real periods for reading agricultural books, scribbling down comparative notes, arranging future plans, and fortifying the mind.

Farm Books.—These are now kept with the greatest ease and simplicity; a "Farmer's Account Book" has only to be bought, and the routine of entries suggest themselves. There may be some little difficulty, but as farm transactions are settled at the moment, but little more is necessary than to record these properly,

The record of money transactions is not the only object to be attended to. An annual account of the live stock, their value, quantity and quality of hay, corn, implements, or other effects in which capital is invested, should also be made—annually.

The very register of these things keeps the farmer's attention alive to what is doing, and what he is to do, and proves the best possible training to produce active and pains-taking habits in young men.

The preceding "Hints" are given with the spirit of fellowship; but let it ever be recorded, that in farming even "such a farm" as I have pictured, all is not sunshine—neither can it be—without the main element—*attention to business.*

Supervision.—The necessity for supervision makes it imperative on the young farmer—no talents will make up for the want of it; it is the *real secret*, the *key-stone* to *successful* farming; without it nothing goes on well—not only is less done, but it is not done so well. Where was it ever known that a man farmed well if he was much from home? The diligent, watchful, enterprising farmer is sure to get on, sooner or later. He is recognised as such, and will be valued accordingly. No matter how good the farm, or how easily managed it is; if a farmer goes much from home, and trusts to his servants, the whole establishment will get into confusion—ruin; while, if a different line of conduct had been pursued, all would have been well—a thriving concern, and the farm itself the best of all "Hints to the Young Farmer."

5.—*The Indication of Age afforded by the Teeth.* By PROFESSOR BROWN, of the Royal Agricultural College, Cirencester.

THIS subject assumes a more important position at present than formerly from the great advances that have been made in breeding and feeding, which, naturally inducing a precocity of development, exercise a modifying influence upon the teeth in common with other parts, and even more particularly upon them as parts of the digestive system.

As the agriculturist is interested in the avoidance of all disputes about his animal's qualification, so he may be fairly expected to know something of the signs by which the age is determined, that he may observe and register any cases of singularly early development in animals which he intends to exhibit, in order that a properly attested statement of the fact may be made to the authorities, and thus even the smallest suspicion of dishonesty prevented.

In all animals whose ages are matters of inquiry we gain most evidence from the incisor or front teeth, from the ease with which the appearances may be ascertained; but in any doubtful cases, the molars, or back teeth, will be referred to with advantage for the purpose of correcting the opinion. The farmer can, however, hardly be expected to know sufficient of the anatomy of these parts to consult them successfully, although to the professional examiner they are more definite than the incisors, besides being less subject to exceptions, and undergoing very marked changes at a time when the incisors are almost useless as tests. It is satisfactory to be able to add that no authenticated case has occurred in which both incisors and molars have shown exceptional appearances; on the contrary, a peculiarity in the one has been invariably corrected by the absence of it in the other.

To enable the stock-exhibitor to examine his animals and form an opinion of the condition of their mouths at intervals, the following tabular view of dentition will, it is hoped, suffice. As no average can be taken in many cases, it will be advisable in such to take two or three periods, such as early, late, and ordinary times for the changes that will be mentioned. Even a fourth period might be permitted, to include instances of extreme precocity; but these are so few that no practical benefit could follow their classification, although they may often affect the opinion of the examiner who is familiar with them. In presenting a formal arrangement of the various ages much interesting matter that might be discussed in a more extended article is by necessity excluded; but a proportionate advantage is found in the conciseness of the statements, and the convenience of reference—two things that justify a condensed description; the more as we have enlarged on the same subject on several occasions. To economise space as far as may be, we shall use the letter T for temporary or milk teeth, and P for permanent or adult teeth. Speaking of the incisors, or front teeth in pairs, we shall employ the abbreviations Cen. (centre teeth, 1st pair), Lat. (the next, 2nd pair), and Corn. (for the corner organs, 3rd pair). In the ox and sheep the presence of four pair of incisors renders another sign necessary; in those animals, therefore, we shall speak of

Cen. (front or 1st pair), Mid. (middle or 2nd pair), Lat. (side or 3rd pair), Corn. (4th pair), adding to these terms the letters T and P when necessary to express temporary or permanent.

The ages in any case are only pursued as far as the restrictions extend.

DENTITION OF THE HORSE.

Incisors (T), 6 in each jaw. Molars (T), 6 in each jaw.
Incisors (P), 6 in each jaw. Molars (P), 12 in each jaw.
Tusks (in male animal), 2 in each jaw between the corner incisor and the 1st molar.

Age.	Incisors.	Molars.
Birth	Cen. and Lat. (T) appear in outline under the gum.	Six (T) in each jaw, 3 on each side top and bottom, also nearly covered by gum.
2 months ..	Cen. and Lat. (T) fairly up ..	Six (T) also up.
9 months ..	Corn. (T) nearly up	The 4th molar, a permanent tooth, begins to appear behind the 3rd temporary.
1 year	Corn. (T) quite up	4th molar (P) well up.
1 year 6 months	Corn. (T) worn on front edge	.. ..
2 years	Corn. (T) worn level on surface, the back edge being in a line with the front.	5th molar (P) well up.
2 years 6 months	Cen. (T) falling out, and the Cen. (P) pushing up in their places.	1st and 2nd molars (T) falling out; 1st and 2nd molars (P) pushing up on each side, top and bottom.
3 years	Cen. (P) well up, and in contact with their opposites.	1st and 2nd molars (P) well up, both sides, top and bottom.
3 years 6 months	Lat. (T) falling out; Lat. (P) taking their place; Tusks generally pricking the gum.	3rd (T) shedding; 3rd (P) and 6th (P) coming up.
4 years	Lat. (P) well up; Tusks usually fairly up, but not fully.	3rd and 6th (P) well up.
4 years 6 months	Corn. (T) falling out; Corn. (P) coming up.	.. ..
5 years	Corn. (P) up, and just touching by their anterior edges; Tusks fully up.	.. ..
6 years	Corn. (P) worn on anterior edge.	.. ..
7 years	Corn. (P) worn nearly all round.	.. ..
8 years	Corn. (P) surface level by wear; squareness of gum round the neck.	.. ..

Dentition of the Ox.

8 incisors (T) in lower jaw only. 6 molars (T) in both jaws.
8 incisors (P) in lower jaw only. 12 molars (P) in both jaws.

Incisors.	Molars.	Early.	Late.	Average.
Eight (T) just pricking the gum.	Six (T) just pricking in both jaws.	.. ..	.. ..	Birth.
Eight (T) fairly up ..	Six (T) fairly up.	.. ..	.. ..	6 weeks.
.. ..	4th (P) behind the 3rd (T).	..	.. ..	6 months.
Incisors worn, and getting apart from each other.	5th (P) behind the above.	.. ..	.. ..	15 months.
Central (P) up 1st pair (2 toothed).	6th molar behind the above.	1 year 6 months.	2 years 4 months.	2 years.
Middles, 2nd pair (4 toothed).	.. ..	2 years 4 months.	2 years 8 months.	2 years 6 months.
Laterals, 3rd pair (6 toothed).	.. ..	2 years 5 months.	.. ..	3 years.
Corners, 4th pair (8 toothed).	.. ..	2 years 10 months.	3 years 9 months.	3 years 6 months.

Between the second and third years the three anterior temporary molars are changed for permanent, and their examination is indispensable for the formation of an opinion; during this time the incisors, as will be seen by the Table, being subject to extraordinary variations.

The remarks under "early and late" refer only to the incisors, both in ox and sheep.

Dentition of the Sheep.

Incisors (T), 8 in lower jaw only. Molars (T), 6 in each jaw.
Incisors (P), 8 in lower jaw only. Molars (P), 12 in each jaw.

Incisors.	Molars.	Early.	Late.	Average.
Six or eight (T) in outline under the gum.	Three (T) on each side under the gum.	.. ..	.. ..	Birth.
Eight (T) well up ..	Twelve (T) up ..	.. ..	.. ..	6 weeks.
.. ..	4th (P) behind 3rd (T).	.. ..	.. ..	3 months.
Central (P), 1st pair (2 toothed).	5th (P) behind the above.	1 year ..	1 year 6 months.	1 year 3 months.
Middles (P), 2nd pair (4 toothed).	.. ..	1 year 9 months.	2 years 6 months.	2 years.
Lateral (P), 3rd pair (6 toothed).	.. ..	2 years..	.. ..	2 years 6 months.
Corners (P), 4th pair (8 toothed).	.. ..	.. ..	3 years 6 months.	3 years.

The sixth molar (P) is cut at 1 year and six months; and during the next year the three temporary molars are changed irregularly, but the evidence they afford is not so direct as in the ox.

DENTITION OF THE PIG.

Incisors (T), 6 in each jaw. Molars (T), 6 in each jaw.
Incisors (P), 6 in each jaw. Molars (P), 12 in each jaw.
Tusks (T), 2 in each jaw. Tusks (P), 2 in each jaw.
Pre-molars (P), 2 in each jaw. These last are small teeth between the tusks and the first molars.

Age.	Incisors.	Tusks.	Pre-molars.	Molars.
Birth	Corn. (T) ..	4 (T) ..	.. ..	Not through the gum.
1 month	Central (T) ..	.. ..	.. ..	Three (T) up.
2 to 3 months ..	Lateral (T) ..	.. ..	.. ..	.. ..
6 months	.. ..	.. ..	4 up ..	4th (P) behind 3rd (T).
9 months	Corn. (P) nearly up.	4 (P) fairly up.	.. ..	5 (P) coming up.
1 year	Central (P) up	.. ..	.. ..	5 (P) up.
1 year 3 months	.. ..	.. ..	.. ..	Three anterior (T) are changed for permanents.
1 year 6 months	Lateral (P) up	.. ..	.. ..	6th (P) up.

The exceptions in the pig are not many. Sometimes the central permanent incisors are not up at 1 year and 3 months, nor the laterals at 2 years, but these cases are very rare, and could not, therefore, be considered in the above Tables, which, we repeat, contain a digest of the subject for the assistance of the agriculturist. In those few cases of exception, the molar teeth have been found to follow the rule, and have consequently prevented any wrong conclusions.

6.—*Culture of Sheep.* By ROBERT SMITH. Extracted from a Lecture in the New Theatre of the South Kensington Museum.

A NUMBER of pictorial sketches and paintings of the various breeds of sheep, English and foreign, ancient and modern, were produced, which added materially to the interest of the Lecture, and were frequently alluded to in elucidation of the subject.

The culture of sheep as a rural occupation is the foundation of all good husbandry. As a branch of national economy it affords employment for thousands of artisans, as well as food and raiment for an increasing population.

Early history of Sheep.—Sheep existed at the earliest periods in every quarter of the globe, from Iceland to the regions of the torrid zone, but they have been most attended to in Europe, especially in Great Britain, Spain, and Germany. They are now being cultivated to a considerable extent in the British Colonies.* In each country they take their character from the wants and tastes of the people, but when left to themselves under the operation of nature's laws they represent every form of carcase and clothing which correspond to or fit them for the particular climate and country in which they exist. It is thus requisite that our breeders should have a proper knowledge of nature's laws, the effect of which has so strong a bearing upon the *future maintenance* of the English breeds.

Original Breeds.—The sheep which was handed down to us from time immemorial was a horned sheep. In support of this, there are amongst the foreign breeds the Russian sheep, Wallachian sheep, the fat-tailed Cape sheep, Cyprus sheep, Moufflon sheep, Syrian sheep, Asiatic argalia, the American argalia, and Merinos, all of which have horns. Our original English breeds were chiefly of the same order. History points to the Dorset, Exmoor, Norfolk, Yorkshire, Shropshire, Wiltshire, Welsh, Scotch white-faced and black-faced, all of which had horns. These ancient English breeds have chiefly disappeared before the plough, and those alone remain where the hand of the husbandman has been stayed by untoward circumstances. By a comparison of the pictorial sketches of the foreign and English breeds, we discover that the Russian sheep and the Scotch black-faced sheep are nearly identical, as are also the Merinos and the Exmoor horns, the only difference being that of their varied cultivation in the different countries.

English Breeds, &c.—Great Britain in the earliest periods of her history resembled all other countries under similar circumstances. There was nothing but bleak hills, undrained plains, and wild commons, and over these uncultivated lands were found no animals but such as were in a corresponding condition. But in the course of time desolation gave way to husbandry, and with it there was a corresponding improvement in the breeds of sheep. Thus it is that we find the black-faced short-woolled sheep of Norfolk transformed into a black-faced Down without horns; the Yorkshire horned sheep into respectable Long-wools; the Shropshire horned sheep into hornless Shropshire Downs; the horned Dorset into improved Dorset and Somerset horns; the black-faced Wiltshire and other Southern-county horns into Hampshire, west-county, and Sussex Downs; the Scotch white-faced horns superseded by the Cheviots and Herdwicks;† the black-faced Scotch and the Exmoor mountain sheep, having been cultivated into a respectable and profitable animal for hardihood, remain. The Welsh mountain sheep are still the same indigenous race; this arises from the great height and bleakness of the Welsh mountains; there is consequently but small chance of their improvement.

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* The Australian and New Zealand colonies, the Cape colony, Canada, British India, &c., have largely increased, and are still increasing, their number of sheep.

† I was struck last year with the beauty of the Herdwick mountain-sheep in the

The marshy plains of England have been grazed from the earliest dates by *coarse* long-woolled sheep. These have been remodelled from extreme coarseness of bone and fleece into a highly profitable class of animals, and are now known as "long-woolled sheep." The Cotswold Hills were also grazed by a similar class of animal, of which mention is made in early history; and in effect that "some Cotswold sheep were presented by our English courtiers to a foreign court." Amongst this class of "Long-woolled," were the old Lincolns, Cotswolds, Romney Marsh, and Teeswater breeds. Their original characteristics are nearly extinct.

The midland counties have long had a class of middle-woolled sheep, amongst them the Ryelands, from which breed it is supposed the new Leicester breed was formed by that eminently-successful breeder Mr. Bakewell.

From the preceding remarks it will be seen that the sheep of the present day are in fact the production of man's skill and enterprize in their propagation from their original wild state.

Propagation of Sheep.—The great work of improvement was steadily carried on by the ancients, and from time to time handed down to their successors. There have been eminent breeders of sheep as well as eminent men in other departments of industry; we have had our Dukes of Bedford, Lord Spencer, Lord Leicester, Ellman, Bakewell, Burgess, Stone, &c., of the past age, who did their duty in thus handing down to us the foundation of the present established breeds—breeds that have been cultivated from indigenous and mountain races.

This stage of improvement was received by men of the present generation, who have succeeded admirably in carrying on this great work of art by propagation. Our country stands indebted to such men as Jonas Webb, the Duke of Richmond, Overman, Sainsbury, Rigden, Grantham, Lugar, &c., for cultivating the South Down; to Sandy, Pawlett, Creswell, Turner, Bodley, Spencer, &c., for the Leicesters; to the Clarkes, Casswells, Kirkhams, Richardsons, Brice, &c., for the Lincolns; to Large, Hewer, Garne, Handy, Brown, Ruck, &c., for the Cotswolds; and

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Lake district. It is much to be desired that the Exmoors and Herdwicks should meet in the show-yard at Cardiff. Successful breeders, such as Mr. Nelson of Gatescarth on Buttermere, would meet with a hearty welcome, as they are always ready to give a hospitable reception to the traveller.—T. D. A.

to many others for their marked success in remodelling their several district breeds, such as the "other short-woolled" and "other long-woolled" breeds.

It is to the early improvers of the parents of what are now termed the "Established Breeds," viz. the South Down, Leicester, and Long-wools, that we stand most indebted—Mr. Ellman, Mr. Bakewell, Lord Leicester, &c. They took in hand the improvement of sheep nearly a century ago; they achieved immense success before numbers were at all aware what they were doing. This course had a close bearing on the production of the established breeds of the present day, early corrections being thus stamped by their males.

It must not be supposed that the race of attempted improvement was all sunshine. Numbers had made the attempt to breed male animals for the correction of other breeders' flocks; they had ended in not even satisfying themselves. Thus it is that great credit is due to those breeders of sheep who have displayed so much ingenuity and talent in their vocation.

Management.—Good husbandry has happily become the rule, and with it we have a corresponding husbandry in our flocks. As the proverb has it, "Sheep have golden feet"—without them but little progress can be made, especially on light land. It would take too long to give a detailed account of their varied management; it differs with the farm, the district, and the climate. The key to manage must be given by a single remark: as the wind rules the weather, so do climate and the soil govern and affect sheep-husbandry. In following the remark on climate, it is interesting to note that the Short-woolled sheep are found upon the southern and south-eastern dry soils; the Leicesters in the intermediate climate of the midland counties; the Long-wools upon the exposed eastern plains, on the Cotswold and other bleak (yet cultivated) hills; and that we have under the head of "other short-woolled breeds," various gradations of the Down diversified by special locality.

Again, in Scotland (while we find the Leicester at the foot of the mountain in all his glory), we find by the stages of altitude as we ascend the Scotch mountain, that the many gradations of hardihood are represented by different breeds of sheep, such as are best adapted to the requirements of each elevation. For instance, at the foot of the mountain we have the Leicester, then follows the mixed Leicester and Cheviot cross, then the pure Cheviot; in the next stage we have the Cheviot and black-faced cross, then the black-faced ewe, and lastly at the very summit of the mountain top we find the black-faced wethers, which it is said no weather can destroy, unless blown over by a tempestuous gale. The effect of warmth, shelter, soil, &c., upon the animal frame may be beautifully illustrated on reference to a map of the United Kingdom.*

The lambing season is alike regulated by local wants; the lambs are, in fact, dropped at different times, according to the uses and requirements of the several districts as regards climate, food, and the after-management which may be pursued for realizing in the markets also. The mountain races, of course, do not drop their lambs until the cold season has passed away, so that the ewes can eat the early grasses as they first spring up. One important fact is, that at the present time lambs are being fatted in every county; and in our best districts sheep are being fatted and sent to market at a year old. Formerly scarcely any sheep were sent under three or four years of age; but as the population of our island had not then so rapidly increased, the public could well afford to wait for their mutton.

In the management of sheep another important bearing should not be lost sight of, viz., that "*warmth is an equivalent to food.*" (See Dr. Playfair's Lecture, Royal Agricultural Society's Journal, 1842; as also Mr. Smith's Essay on the Management of Sheep, Royal Agricultural Society's Journal, vol. viii. p. 1.)

The use of Sheep as food.—There is no other animal so important in this point of view as the sheep. Mutton constitutes the grand staple food of this country; hence the improvement of the several breeds has a close connexion with the increase of population. The distribution of meat when fatted is beautifully arranged, and harmonizes well with the varieties of breeds, and districts from whence they come. In the consumption of meat some prefer early lamb, others the black-foot saddle or neck of mutton, &c., while others again, having less money to spare, make a different choice, possibly from the "long-woolled breeds." Let a person only attend the "Metropolitan Cattle Market" early on a Monday morning, and remain all day, he will then notice the order in which the different class of customers attend to make their purchases. At early dawn we have the West-end butchers "picking" their choice selections from the many; then come the purveyors for the mass of the middle classes; and at noon come those useful "clearers," whose business lies chiefly with the working classes, and who must have "a lot" of meat for their money. Hence the moral to breed, if climate permit, animals for the customers who attend at "early dawn."

A very remarkable alteration has taken place of late years with regard to the conveyance of sheep to market, and the return to the seller. Formerly the sheep had to be on foot many days, even weeks, in *walking* to London, and each sheep lost many pounds of meat on the way—an absolute loss. Now sheep are conveyed from the country to market in a few hours, and the farmer or dealer has his money at once for them, and can so much the sooner employ it again. This is *one* of the great improvements afforded by railway accommodation.

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* This map was referred to, and its bearings fully explained, during many stages of the Lecture.

With regard to the "dead meat" markets, here again a new state of things has grown up. Meat is now sent from Scotland and other parts of the kingdom, which did not come formerly; and rapidly as people from various districts have located themselves in and around the metropolis, the supply of meat has followed them in the same ratio.

Their wool.—The great importance of sheep in relation to the wool-bearing properties is daily increasing. In 1835 the total estimate of British growth was 108,000,000 lbs., while, in 1857, it has been again estimated by Mr. Ashworth at 143,042,782 lbs. Beyond our own growth, the imports of wool from Australia in 1807 amounted to only 245 lbs.; whereas in 1855, the latest period up to which the returns extend, the importation was 40,810,137 lbs. In 1833 we received from India 3721 lbs., in 1855 the importation was 4,594,520 lbs. The total imports of wool from all places, in 1855, amounted to 99,300,446 lbs.

Mr. Smith concluded his Lecture by remarking that the properties of wool and its uses in manufacture would be taken up by a gentleman from the North of England well acquainted with manufacture.

7.—*Report of a Second Visit to Polsew Farm, the property of Richard Davey, Esq., M.P., Polsew.* By Mr. KARKEEK, Truro.

TWELVE months ago I gave a short account of a new system of feeding cattle on Polsew farm with fermented turnips and chaff straw. (See 'Journal,' 1857, page 314.) My object in directing your attention a second time to this subject is to show that a greater profit was realized on the sale of the 32 bullocks than was anticipated. Mr. J. Kendall's valuation was about a fortnight previous to the sale 23*l.* 10*s.* each; total 752*l.*; thus—

The sale by auction amounted to		£792
Original cost of 32 head of cattle	£544	
Expense of keep, according to previous estimates, at 6s. per week, consisting of fermented food, in the proportions of 90 lbs. of turnips to 7 lb. of chaff-straw, given to each animal per day, with 4 lbs. of linseed cake ..	124	668
Profit		£124

Or 3*l.* 17*s.* 6*d.* per head in 13 weeks.

Another reason for again directing your attention to this method of feeding arises in consequence of some little grumbling on the part of some few butchers, who were purchasers of these bullocks at the public sale, with reference to the internal fat. They complained of a great deficiency in this respect compared with cattle fed in the ordinary manner in Cornwall. That this was really the case with some of the bullocks there cannot be any question; and we can scarcely expect that cattle fattened in the rapid manner described in my previous report—say four months on the average—could possibly accumulate so much internal fat as cattle that had been feeding for twelve months.

The internal fat of an ox is an accumulation of slow growth. Some breeds are disposed to accumulate fat in this manner in a much greater degree than others. The Jersey cattle, and crosses of the Jersey and Short-horn breeds, are remarkable instances of this. The Short-horns also generally carry more inside fat, in proportion to their size, than the high-bred Devons, where the fat and muscle are generally well mixed, whilst in the common coarse breed of the Devon kind we have more inside tallow. I think, as a general rule, that the better the milching properties of cattle, the more are they disposed to internal accumulations of fat; and it should be understood that excessive accumulations of this kind are the farmer's loss and the butcher's gain.

However, I have not heard of any similar complaints of late on the part of the butchers. The Rev. T. Phillpots, of Porthgwidden, has been practising the same system of feeding his cattle on fermented food during the past twelve months. He says, in reply to some inquiries of mine respecting the results of this system of feeding, "You are aware that I watched Mr. Davey's experiment last year, and, with full confidence in its success, followed it. Last year my bullocks consumed each, on an average, about 145 lbs. of swedes per day, cut by one of Gardener's turnip-cutters, together with an almost unlimited allowance of straw, and 2 lbs. of linseed cake. It is right to say that they were well fed and gave great satisfaction to the butchers. The stock this year, on the new system, consumed only 90 lbs. of grated swedes per day, with 7 lbs. chaff, fermented, and a little hay or straw at night, besides 2 lbs. of linseed cake each. They have thriven better on this system of feeding than on the old expensive one, and two that were killed by Mr. Thomas last week quite convinced me that the butchers have nothing to fear on this new plan, but, on the contrary, Mr. Thomas assured me that these two bullocks, only put up to feed on 19th November (the Rev. gentleman's letter is dated 5th March), were the heaviest for their size he ever killed, and full of tallow. It seems clear, then, that one-third of the food is saved, so that *three* beasts may be fed instead of *two.*" Mr. Phillpot's experiments are very pertinent to the subject, and I have great pleasure in giving publicity to them.

It should be remarked that the great accumulation of valuable manure * in the feeding boxes is not taken into consideration in estimating the profit realized on the sale of Mr. Davey's cattle. It was stated in the first Report that each box was 8½ feet square, and that the dung was allowed to accumulate in the boxes for two months, and on its removal it averaged six loads in each box. These boxes were in course of cleansing during my visit in February last, and I am informed that they made out 192 loads, which, with 150 loads from the piggery, were carted and spread on the grass lands at the rate of 20 loads per acre.

Respecting the pigs and Mr. Davey's method of feeding them, together with the cleanliness and comparative comfort evidently enjoyed by them in the piggery, much might be written; but as to the profits derived from them, it appears almost impossible to arrive at any accurate calculation, inasmuch as the pigs consume all the waste food on the farm. The stock of pigs valued at Michaelmas amounted to 275*l.*, and Mr. Davey is of opinion that this branch of rural economy gives a greater profit than any other on the farm.

I will conclude this paper with a short account of Mr. Davey's system of farming Polsew estate. It consists of 264 acres. The parish in which it is situated—Philleigh—is generally considered to be one of the best for grazing in the county. The estates generally let for 35*s.* to 40*s.* per acre. Polsew estate, when Mr. Davey purchased it, was valued only at 25*s.* per acre—this in consequence of previous mismanagement. Ploughing had been pursued, and harvest had followed the seed time; but no one in the district remembers any artificial manure carried on the estate for fourteen years. The stock kept on the farm was also very inconsiderable, and consequently a very small quantity of manure had been manufactured at home.

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* Mr. Charles Lawrence, in a communication to the Journal of the Royal Agricultural Society of England, November, 1857, shows the relative value of farmyard manure, made in the ordinary manner, and manure from the cattle-boxes.

Analysis of Box Manure and Yard Manure, by PROFESSOR WAY.

Water, per cent.—	Box Manure.	Farmyard Manure.
100 parts, dried at 75° to 80° Fahr.	71·4	71·0
Nitrogen equivalent to ammonia	2·37	1·7
Organic matter removable by water	6·42	1·82
Inorganic matter, consisting of—		
Phosphoric acid	0·30	0·26
Alkalies	2·00	0·80
Lime, a trace,		

Mr. Davey commenced his farming operations by draining some sixty acres, and by the destruction of some miles of fences, which at once improved the appearance as well as the real value of the property. He laid down a system of rotation at the commencement, viz., wheat, roots, barley, and seeds, for three or four years, and in some cases laid out to permanent pasture. He commenced liming for wheat at the rate of 130 bushels per acre, and continued this practice throughout the whole rotation. The turnips and mangolds which followed the wheat were highly manured with three quarters bone-dust, guano, Lawes' superphosphate—the whole valued at 5*l.* 5*s.* per acre.

This may be considered very expensive farming; but, as previously intimated, the estate, although possessing a first-rate soil, had been so miserably ill-treated, that Mr. Davey considered it necessary to give it a good dressing at once, which should have an immediate and permanent effect—the guano and Lawes' superphosphate supplying the former and the bone-dust the latter. In addition to the above expensive dressing, the cost incurred in cleaning the land from its foul state as a preparation for the turnip crop, including the necessary workings, raking, and hand-picking of the *stroil*, amounted to 2*l.* 2*s.* per acre.

It may be asked by some, will this outlay pay? These are questions oftentimes asked by those who do not understand the principle, that if an animal or an estate does not pay when well and properly supplied with the necessary pabulum, neither will they pay for being stinted or starved. The same rent, taxes, ploughings, and other incidental expenses, pertain to an indifferent crop as to a very good one—the cause of the difference being only the extra amount expended on labour and artificial manure per acre, and which will be certain to pay handsomely for the outlay in a few years.

It is the proprietor who ought to know whether his system of farming pays for the outlay, and yields him an interest on the expenditure for the very great improvements in the aspect of the estate, produced by efficiently draining, and squaring and fencing his fields and extra manuring afterwards. I can give you a few particulars also on this head:—The wheat crop averaged 36 bushels per acre; the swedes 30 tons and mangolds 50 tons per acre; and the barley crop which followed, without any manure, averaged 60 bushels per acre. The grass seeds were exceedingly fine; the clover hay averaged four tons dry hay per acre.

In consequence of this great outlay almost at once, the farm is now considered to be worth 50*s.* per acre; at all events Mr. Davey values it at this sum in making up his balance sheet. During the three first years of Mr. Davey's occupation, the estate scarcely maintained 8 working oxen, 8 horses, and 100 sheep.

On the 29th September last, after one rotation, the stock was valued by competent persons as follows:—

46 head of cattle, feeding and store	£1025
282 sheep	600
144 pigs	275
Corn	800
Hay	140
Roots	400
14 horses and colts	270
Implements of husbandry	350
	£3860

Total size of farm	264 acres.		
Deduct wood	8		
Including hedges	256	.. at £15 ..	£3840

I mentioned in my last Report that Mr. Davey intended trying the experiment of house-feeding sheep on the same description of food as is given to cattle. The open sheds, and yards attached, now in course of building, are admirably adapted for this purpose. This must form the subject of another communication.

T. D. Acland, Esq.

8.—*The Exmoor Cottages.* By Robert Smith.

The recent discoveries of extensive iron lodes upon Exmoor resulted in the leasing of these minerals to three extensive iron companies. With them came a new class of men: miners from a distance. As a consequence, additional cottages were required. This, a new era upon the property, called for some consideration as to their probable number, size, plan, and cost of erection.

In order to avoid concentrating too many families together, and to give to each ample garden ground, according to their requirements, groups of from three to seven cottages were determined upon, of which groups some were to be erected near the works, others on convenient sites adjoining the public roads. The varied class of men to be employed upon the mines suggested an equally varied class of cottage, both as regards space and rental. For instance—

The mining captain would require a better cottage, say equal to two small ones.

The miner—a man with an up-growing family—would require, at least, three commodious bed-rooms, and would be able to pay extra rent for them.

Miners without families would require a cottage at a lower rental—say one with two bed-rooms.

I find this scale of gradations as to size and rental to be highly approved. The garden ground gives employment for the leisure hour, and is alike conducive to health and family ties, in exchange for the old associations of the public-house. Having long been of opinion that a pair of cottages, with two bed-rooms each, might be built for 100*l.*, I gave Mr. Geen, builder, of Lynmouth, the following instructions, with the request that he would furnish me with a plan of a group of cottages, which he would undertake to build at 50*l.* each.

Specifications.—The walls to be built with native stone, raised within 200 yards of the site; the woodwork to be of good foreign timber, and the roof covered in with 9 by 18 inch sized Cornish slates. The cottage to contain four rooms, two above and two below, with a privy to each cottage.

Mr. Geen's proposal I give in his own words:—

"I will agree to build four or six cottages on Exmoor, according to the specifications you sent me, provided they are erected upon level ground, and not exceeding 200 yards from the stone quarry. I enclose a sketch of their end elevation, ground plan, &c.

"I propose to build the walls with one bushel of lime (2 cwt.) to the perch of walling; this to be mixed with good native sand.

"The roofing to be framed with rafters, 4 by 2 inches, halved together in the head, with a span or brace piece 3 by 1½ inches, which will also serve for ceiling joist, to be fixed to the wall plate at the foot. The wall plate to be 12 inches wide by 1½ inch thick.

"The joists to be wrought, 6 by 2½ inches, and placed 18 inches apart.

"The roof to be properly covered with Cornish 18 by 9 inch slates. The flooring of bed-rooms 1 inch deal boards, ploughed and tongued (no ceilings under). The eave-trough between the roofs to be of cast-iron, 9 inches wide, with turned-up sides, as shown in section. The bed-rooms to be ceiled against the rafters and brace pieces.

"The windows to be 4 by 3 feet, with red deal frames and sash casements.

"The outer doors to be 1-inch board, with four ledges. The inside doors ¾-inch board, with ledges.

"The stairs to be yellow or white deal.

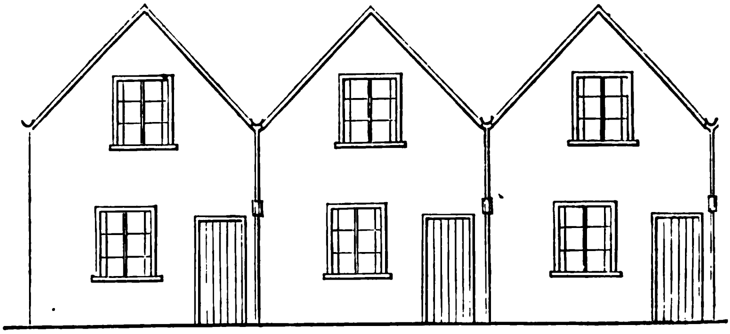
"The ground-floors to be concrete or native flagstone.

"The bed-rooms, ceilings, and inside walls to be plastered with two coats of mortar. The outer walls to be pointed, to show the natural faces of the stone.

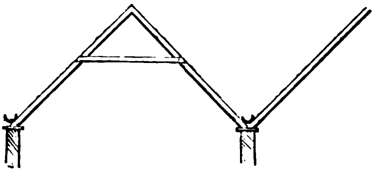
"The chimney-pieces to be of wood, but not to find grates or furnace.

"The cupboards—will fix a cupboard in each living room, and provide each cottage with a privy for the sum you mention, 50*l.*"

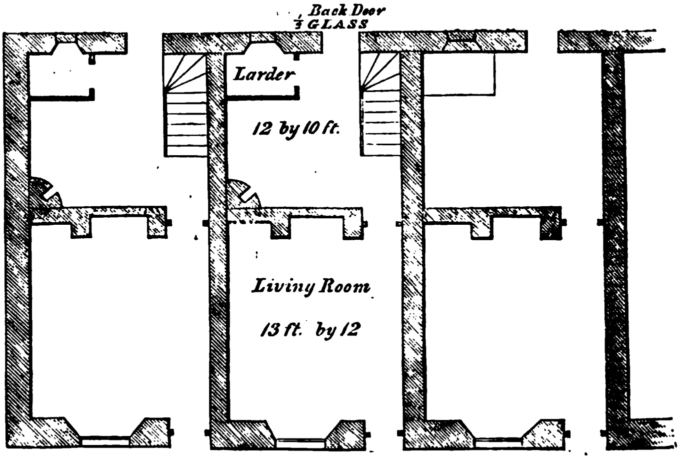
Then followed a second request for the extension of the above plan of cottage (adopting that plan as a basis) into a cottage containing three good bed-rooms, and more spacious offices on the ground floor. It was also suggested that the groups of cottages should be built in odd numbers, and that each alternate cottage might be placed so far back as to afford room in front for a suitable porch, say five feet wide, so as to admit of a side door from the projecting cottage (the door of the other cottage being placed at the other front corner). These to be built at 60*l.* per cottage.



Front Elevation, with corresponding Gables, &c., at the Back.



Section of Roof and Guttering.



Ground Plan of Cottages, with two Bedrooms over—cost of each 50*l.*

In reply, Mr. Geen wrote to me as follows:—

"I will agree to make the additions you propose for building five or seven cottages in one block, that is to say, I will arrange them so that every other cottage shall project 4 feet 9 inches to the front, so as to admit of a doorway in the side of the projecting cottage, and will cover the recess (in front)* with slates to serve as a porch for the two cottages, the corresponding recesses at the back to be left open.*

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* It is to be feared that the porch will seriously darken the principal room of

" The depth of the joists to be 7 in. instead of 6, as in the 50*l.* cottages.

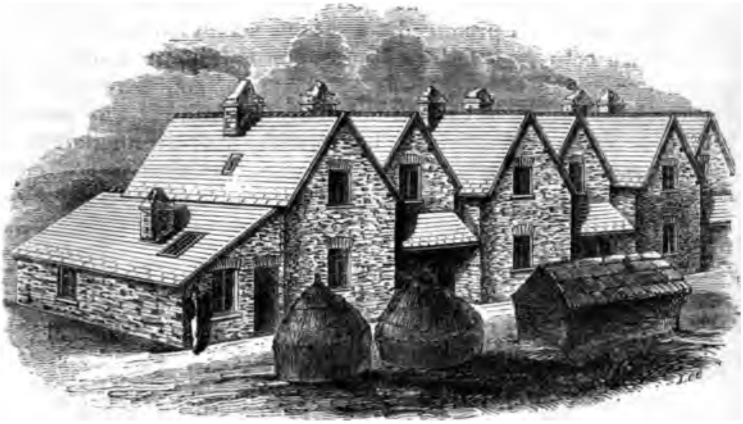
" The living room of these cottages to be 15 by 13 feet.

" Back-room, 13 by 10 feet, and make *three bed-rooms* in each cottage, with a privy to each, at 60*l.* per cottage."

This latter plan, &c., has been adopted by the Dowlais Iron Company upon their works on Exmoor, and erected by Mr. Geen at the above prices, and who is ready to erect any number at 60*l.* each, or those with two bed-rooms at 50*l.* each. The former are now occupied by the Company's miners.

With a view to give the best illustration of these cottages, I have had them photographed by Britton and Son, Barnstaple, whose exactness of copy would not even omit the "miner's turf stack," their winter fuel.

The lean-to building at the eastern end is an office for the Company's works; it forms an excellent protection and finish to the building.



The Exmoor Cottages with three bed-rooms—cost of each 60*l.*

9.—*The effect of Superphosphate or Guano on Turnips, when hoed in as a top-dressing.* By T. D. ACLAND, Jun.

IT is, I believe, usually taken for granted that a top-dressing of superphosphate cannot be applied to turnips with any advantage.

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the cottage to which it is attached; perhaps a few strong glass-slates in the porch roof would obviate this objection, at an expense of about 20*s.* for every alternate cottage.—ED.

* That is without a porch.

It may be of use, therefore, to record a single fact which, if confirmed, would tend to prove the contrary.

I took in hand, in 1856, a field which has borne a bad character for a good many years; it is what is called cold poor clay, at a high elevation, on Sprydon hill, or, as it is called on the maps, Spreydown. The field was in worn out old pasture, and foul; part of it was broken for turnips, which were manured with an average dressing of superphosphate drilled, and guano broadcast, at the time of sowing. According to my usual practice in applying any manure, I desired my man to leave a portion of the field unmanured; and on one strip of this unmanured spot, after the turnips were in rough leaf and ready for hoeing, to try the effect of a top-dressing, or what a Yorkshireman would call a hand-tillage, of guano; on another strip the effect of a like application of superphosphate. I confess I did not expect much result, and my man was well laughed at by a neighbouring farmer, and told that no money in the parish was so certainly thrown away as the cost of what he was then doing.

It was evident to the eye as the crop advanced that a considerable effect had been produced—what one would call at first sight a difference between a failure of crop and half a crop; so a small quantity, a perch of each, was weighed: no doubt we ought to have weighed more, but it was not convenient, and it was evident that there was a real difference between the strips throughout.

The result was as follows:—

	Weight of a Perch.			Average per Acre.
	Roots.		Greens.	
	cwt.	lbs.	lbs.	tons.
Guano (broadcast at hoeing time)	1	30	55	9¼
No manure.—1st Strip	0	55	22	4
Superphosphate (broadcast at hoeing time) ..	1	50	56	10½
No manure.—2nd Strip	0	80	21	5¾
Superphosphate drilled Guano broadcast .. } at sowing	2	27	37	16

I would not attach too much importance to a single fact unless it be confirmed by others, but we see here, as far as this case goes—1st. The natural condition of a poor field, without the addition of phosphate of lime, producing only between four and five tons of turnips. 2ndly. The combined effect of superphosphate and guano at a cost of say 30*s.*, producing 12 tons of turnips additional, which, at only 5*s.* a ton, would pay double for the outlay. 3rdly. The power of either guano or superphosphate to fetch up a bad crop within certain limits, the outlay being about 15*s.*, the return about 25*s.* or 30*s.*, at what is called a consuming price for the roots; or, counting the benefit to the subsequent corn crop, considerably more.

10.—*Remarks on Wheat Experiment.* By C. F. BURNARD.

Sutton Road, Plymouth, June 29, 1857.

DEAR SIR,—I beg to lay before you some results of a great deal of consideration given to your Field Experiment, 'Bath and West of England Agricultural Journal,' p. 351. I cannot produce anything tangible by connecting it and the former (turnip) experiment together, and therefore confine my remarks to the wheat trials.

It appears the best results were obtained with mineral manures crossed with nitrate of soda.

Next, mineral manures and sulphate of ammonia.

And then, mineral manures and guano.

Does it not seem that the south-west corner of the field is of better quality than the centre; or if a line be drawn from the south-east corner to the north-west corner we shall cut through the least productive parts, the good quality of the south-west corner somewhat making up for the inferior manuring?

Omitting the parts eaten off by the fly in 1856, and those injured by the cart track, we have the following results (averages):—

No.	Corn.	Straw.	Chaff.		Corn.	Straw.	Chaff.	Per cent. of Chaff to Straw.
				No Manures.				
1.	60½	114½	10½	=	100	190	17·7	9·3
				Mineral Manures only.				
2.	64	122	14½	=	100	196·4	23·2	12
				Mineral and Ammoniacal.				
3.	94·8	173·6	14·6	=	100	182·5	16·3	8·9
				Ammoniacal only.				
4.	80·6	161·8	14·1	=	100	199·5	17·7	9·3

Calling 1 the normal condition of the results:—contrasting it with 4, then we find the percentage proportions much the same, chaff to corn and chaff to straw identical; showing that the ammoniacal manures, while affording nitrogen for the grain, excited * the soil to yield the necessary mineral ingredients to sustain the normal condition; thus while we have an increased produce we have the whole in relation.

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* Term of convenience.

In 2 all mineral, and no ammoniacal.

Here we have a large increase of chaff, leading to the inference that the necessary mineral constituents for both grain and chaff are carried up into the germ; but if, from the absence of nitrogen, the gluten, &c., cannot be developed, then that portion of the minerals which would have been taken into the grain is thrown into the chaff. The straw does not seem to have so near a relation by far to the grain as the chaff has, and we may suppose that the sum of the minerals in the chaff and corn is the same, but that the distribution is determined by the absence or presence of available nitrogen.

In 3, where we have mineral and ammoniacal, the nitrogen has induced an extra flow of minerals into the grain at the expense of the chaff.

What is very peculiar, that under the same circumstances the chaff has a *constant* relation to the straw. Thus, "No Manures," in seven cases out of twelve, the percentage of chaff to straw runs:—

8·9 .... 8·4 .... 8·9 .... 8· .... 8·7 .... 8·4 .... 8·8

Mineral only:—

11·7 .... 11·5 .... 11·6 .... 10· .... 12·2 .... 10·8
12·5 .... 12·7 .... 11·9 .... 11·8 .... 11·8 .... 12·7

The preceding are sufficient to illustrate my meaning.

The results are somewhat interfered with by the unsatisfactory character of the former trial, and I look forward with some degree of expectation to the results of next harvest.

T. D. Acland, Esq. CHARLES F. BURNARD.

11.—*Report of Experiments on Killerton Farm.*

By T. D. ACLAND, Jun.

1. *Experiment with Wheat on Soils specially prepared.*

I MENTIONED in a former Journal (iv., 278*, 279*), that I had sunk five trenches 6 feet wide, 2 feet deep, and filled them in with special soils, and that I proposed to try some experiments on these soils with mineral and nitrogenous manures. The experiment as regards manure failed the first year, 1856, owing to blight. Last year, 1857, instead of trying the effect of different manures on each soil, I merely weighed the produce of each trench without adding any manure, thinking that by so doing a basis for any future experiments might be obtained.

The nature of the soils placed in the trenches are stated in detail in vol. iv., 279*.

The result is as follows:—

	Straw. lbs.	Corn lbs.
1. Natural soil of the field (rich loam) ..	23	5
2. Clay and sand	22	5
3. Clay and cob	43	6
4. Sand and turf (cut over the sand-pit) ..	43	8
5. Sand alone	9	2¼
6. Sand and dung (a heavy dressing applied in 1855)	61	8
7. Natural soil	29	10

If any conclusion can be drawn from the above experiment with confidence, it is the importance of carbonaceous food to the wheat plant. In every case in which vegetable matter is added, the weight both of straw and of corn is increased. The cob contains straw, the turf can contain nothing but what it has derived from the atmosphere, being taken from the same spot as the sand itself, and yet the sand mixed with turf produces a weight of grain equal to that produced by an over-dose of dung which, though applied three years ago, has not exhausted its rankness.

The object aimed at in this experiment was to subject some patches of wheat to special conditions of soil, and yet to place them in the open field, so as to be in all other respects open to the ordinary influences to which farmer's corn crops are liable.

I fear I shall not be able to report any experiments with special manures this season; but only to repeat a statement similar to the present as to the produce of each trench. I shall be happy, however, to receive any suggestions as to special trial of manures next season. The trenches are 6 feet wide and about 30 long.

2. *Experiment with Swedes*, 1857.

I am obliged again to report an experiment which proves little, except the great caution which ought to be exercised in drawing conclusions from field experiments. Here are 50 plots, of 4 perches and 8 perches respectively; five spots marked O O having for the third season no manure at all; twenty spots marked O, having phosphate without nitrogen, and five having ammoniacal manure or guano alone; and the rest have both phosphoric and nitrogenous manures; yet no part of the field rises more than one ton per acre above the average of the unmanured spots, while some of the manured spots fall two or three tons below the same average.

The column, No. 4, has been a most refractory subject for the last three years. Having never received any mineral manure, it has, nevertheless, had a provoking tendency to rival its more highly fed neighbours. In 1855 I tried the effect of potash; but last year, 1857, I thought it would simplify the experiment if the longitudinal dressings in the direction from E. to W. were confined to phosphates, the cross-dressing from N. to S. to sulphate of ammonia, nitrate of soda, and guano. In 1856 the columns 1 and 2 were treated with the mineral elements of wheat and silica with reference to Liebig's theory. In 1857 column 2 was treated with burnt bones dissolved in muriatic acid. No. 1 having the same sort of bones dissolved in sulphuric acid. This arrangement was intended to put to the proof Liebig's paradox in his answer to Mr. Lawes, that the effect of superphosphate might be due to the sulphuric acid. The columns then running in the direction from E. to W. stand thus :—

No. 1, with bones dissolved in sulphuric acid.

No. 2, with bones dissolved in muriatic acid.

No. 3, with ordinary superphosphate, containing 18 per cent. of soluble phosphate.

No. 4, with no manure at all (except at the crossings).

No. 5, with an equal quantity of concentrated, or extra soluble phosphate, containing 41 per cent. soluble phosphate ; this strip is therefore manured at double the expense of No. 3.

The cross-dressing on the lines B, H, running from N. to S., 56 lbs. sulphate ammonia, or 2 cwt. per acre.

Cross-dressings on lines D, K, 56 lbs. of nitrate of soda, or 2 cwt. per acre.

Cross-dressings on F, 56 lbs. guano, or 2 cwt. per acre.

A, C, E, G, I, L, no cross-dressing.

The unsatisfactory character of the result may, I presume, be attributed to the unusually dry weather which prevailed last summer.

I ought to mention that not far from the N.W. corner of the field is an enemy in the form of an elm tree, against which I meditate an attack in the form of sapping and mining, as his roots probably account for the low produce, noticed by Mr. Burnard, in that part of the field.

With a view to have a second check to column 4, I have this year drilled no phosphate from E. to W. in column 2 ; the field is now in barley, with three lines dressed with phosphates at a higher rate than heretofore, two lines blank with no drilled manure, and the cross-dressings of sulphate ammonia, nitrate of soda, and guano, as before.

I hope the results at harvest may be more worth communicating than the present report.

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EXPERIMENTAL FIELD.—*Swedes*, 1857.

See Journal Vol. IV. p. 227.
Vol. V. p. 351.

E
N—|—S
W

osphate Bones & ic Acid, er Acre.	Muriphosphate, or Burnt Bones, & Muriatic Acid, 2 Cwt. per Acre.	Ordinary Superphosphate, 2 Cwt. per Acre.	No Drilled Manure.	Concentrated Superphosphate, 2 Cwt. per Acre.		Produce of 40 perches and 20 perches alternately stated at the rate per Acre in Tons.
l.	2.	3.	4.	5.		
wt. 5 O	Tons. Cwt. 12 7 O	Tons. Cwt. 11 15 O	Tons. Cwt. 12 0 OO	Tons. Cwt. 11 3¼ O	Four Drills left unweighed. Grass Field adjoining. No Hedge.	No Cross-Dress Tns. Cwt. 10 12¼ Roots.
wt. 7¼	Tons. Cwt. 9 14	Tons. Cwt. 10 17¼	Tons. Cwt. 11 1¼ O	Tons. Cwt. 11 12¼		Cross-Dressing. 56 lb. Sulph. Am. Tns. Cwt. 10 10¼ Roots.
wt. 1¼ O	Tons. Cwt. 10 10 O	Tons. Cwt. 10 15 O	Tons. Cwt. 11 0¾ OO	Tons. Cwt. 11 3¼ O		No Cross-Dress Tns. Cwt. 10 14 Roots.
wt. 0	Tons. Cwt. 10 9	Tons. Cwt. 11 9	Tons. Cwt. 11 9	Tons. Cwt. 10 16¾		Cross-Dressing. 56 lb. Nit. Soda. Tns. Cwt. 10 16¾ Roots.
wt. 3 O	Tons. Cwt. 10 5¾ O	Tons. Cwt. 11 4 O	Tons. Cwt. 10 18 OO	Tons. Cwt. 9 0¾ O		No Cross-Dress Tns. Cwt. 10 1¼ Roots.
wt. 2¼	Tons. Cwt. 8 7¼	Tons. Cwt. 10 16¼	Tons. Cwt. 11 0	Tons. Cwt. 10 9		Cross-Dressing. 56 lb. Guano. Tns. Cwt. 9 19 Roots.
wt. 6¼ O	Tons. Cwt. 10 5¼ O	Tons. Cwt. 11 13¼ O	Tons. Cwt. 10 17¼ OO	Tons. Cwt. 10 15¼ O		No Cross-Dress Tns. Cwt. 10 3¼ Roots.
wt. 9¾	Tons. Cwt. 9 11	Tons. Cwt. 11 12½	Tons. Cwt. 10 7¼	Tons. Cwt. 9 2¼		Cross-Dressing. 56 lb. Sulph. Am. Tns. Cwt. 9 12¼ Roots.
wt. 2¼ O	Tons. Cwt. 10 16¾ O	Tons. Cwt. 11 8 O	Tons. Cwt. 11 9¾ OO	Tons. Cwt. 11 2¼ O		No Cross-Dress Tns. Cwt. 10 7¾ Roots.
wt. 7¾	Tons. Cwt. 10 17¼	Tons. Cwt. 11 9	Tons. Cwt. 10 17¼	Tons. Cwt. 12 0		Cross-Dressing. 56 lb. Nit. Soda. Tns. Cwt. 10 16¼ Roots.
		Not weighed.				

s and ic Acid.	Bones and Muriatic Acid.	Ordinary Superphosphate.	No Phosphate for 3 Years.	Concentrated Soluble Phosphate.	
s. Roots. Greens.	Cwt. lbs. 76 8 Roots. 13 92 Greens.	Cwt. lbs. 84 55 Roots. 14 56 Greens.	Cwt. lbs. 83 0 Roots. 12 28 Greens.	Cwt. lbs. 80 72 Roots. 11 41 Greens.	{ Actual weight of each column of 60 perches.
er Acre.	10¼ Tns. per Acr.	11¼ Tns. per Acr.	11 Tns. per Acre.	10¾ Tns. per Acr.	{ Average rate per Acre (Roots).

12.—*On the Meteorology of the South-West of England*, 1856-7.

By NICHOLAS WHITLEY.

Truro, May 10, 1858.

THE temperature of the air in the month of October was nearly 5° above the average in the western counties, and 2½° at Greenwich; very heavy rain fell during the commencement of the month, particularly during the night season, but the latter end of the month, with easterly winds, was remarkably fine, and afforded a good opportunity for the autumnal clearing of stubbles.

The temperature of November was that of the average of the month, and December was above the average. A heavy gale from the S.W. occurred on the 6th, 7th, and 8th of December, raising the maximum temperature of the day to 57°, and that of the night to 54°, driving the warm air of the Atlantic over the land, and raising the temperature of the season full 12° above the mean. I have ascertained that the temperature of the surface-water of the Atlantic increases about 10° 400 miles west from the Land's End. Heavy and continuous gales from the westward bring the warm air from this part of the ocean over the land, causing often a very high temperature in midwinter.

In January, February, and March the temperature of the air was above its mean value; the weather was mild and wet, except during February, which received far below its average of rain.

The spring months were unaccompanied by the usual easterly wind.

In the beginning of May the east wind blew steadily for a week, bringing its invariable accompaniment of cold nights and open sunshining days; the remainder of the month was mild and genial.

June was a dry month, with a temperature 4° above the average. The early hay harvest was saved in excellent condition, but the heavy thunder showers at the latter end of the month and in the beginning of July considerably damaged the late crops.

A strong gale occurred on the 14th of June which did considerable damage to the orchards; the tender buds of the trees were blighted to such an extent that many trees withered and died, and a large quantity of the newly set fruit was destroyed. It fell also on the cherry and pear trees, the oak and the beech were likewise blighted, and even the hardy nutall withered under its effects. It must obviously, therefore, be attributed to atmospheric agency only. The same kind of blight passed over the orchards the previous year.

July and August were remarkably warm months, being 3° and 4° above the average, and producing corresponding effects on the wheat harvest, which commenced in the beginning of August, and in about a fortnight the whole crop was saved in excellent condition.

A violent thunderstorm on the 13th of August burst over the midland counties, but it was scarcely felt in the west, where the weather continued fine and very warm to the end of August.

TABLE I.—Showing the Mean Temperature of each Month for the Places mentioned, 1856-7.

Names of Places.	Height above the Sea.	Oct.	Nov.	Dec.	Year.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.
	feet.	°	°	°	°	°	°	°	°	°	°	°	°	°
Greenwich (mean of 35 years)	159	50·4	43·6	39·4	49·4	36·5	38·8	42·0	46·8	53·7	59·7	62·5	61·9	57·3
Truro (mean of 10 years) .	55	51·1	47·1	43·8	51·1	42·8	42·7	44·6	48·6	54·1	58·8	60·1	61·1	57·7
		1856.				1857.								
Truro (Royal Institution) .	55	55·5	47·2	45·3	51·7	42·1	43·1	44·0	..	..	..	..	..	..
Scilly Isles	..	56·3	50·4	48·2	54·2	44·8	45·9	47·5	51·1	55·4	61·3	62·7	66·8	62·5
Guernsey	..	55·6	47·6	46·3	52·0	42·5	42·3	44·3	47·9	53·8	60·6	63·0	65·0	62·4
Helston	106	56·6	48·3	47·3	53·7	43·0	45·9	46·4	50·3	55·2	63·0	65·6	66·9	66·9
Exeter	140	54·6	45·8	43·7	52·2	40·5	42·9	43·8	..	55·8	62·8	64·2	66·5	66·7
Torquay	160	54·3	44·8	43·5	..	..	..	..	47·4	53·3	61·5	63·7	63·5	59·1
Braunton	40	54·3	46·0	44·6	51·3	40·5	43·0	42·0	46·4	52·9	62·9	63·1	66·1	61·3
Otterhead	..	51·0	41·8	40·3	47·6	36·8	38·4	40·1	44·8	51·4	59·7	61·5	62·8	57·8
Taunton	70	51·1	41·7	40·1	50·0	37·3	39·7	40·8	47·5	54·7	62·0	62·5	65·0	54·0
Ventnor	150	56·2	45·3	43·9	52·5	40·0	43·1	44·7	47·8	54·2	62·1	63·8	66·3	62·9
Clifton	228	52·1	42·0	41·6	49·7	37·1	39·1	42·1	46·6	53·3	61·9	63·2	65·3	59·7
Oxford	210	50·7	41·3	39·8	49·1	36·5	39·1	41·3	46·2	52·6	61·0	63·0	64·4	59·1
Greenwich	159	52·9	41·2	40·2	51·2	36·9	39·8	43·2	47·3	55·5	63·2	61·0	67·2	61·1
Norwich	39	51·5	41·0	37·4	49·3	33·9	38·2	41·8	46·4	54·8	59·5	64·9	61·1	60·7
York	50	48·9	37·7	37·2	46·0	33·8	35·8	39·7	43·8	50·1	58·6	60·5	62·5	56·9
Isle of Man	..	53·8	45·0	42·0	49·1	..	42·5	42·2	49·9	51·6	59·4	59·6	62·1	58·0

Table II.—Showing the Depth of Rain in Inches for each Month at the Places mentioned, 1856-7.

Names of Places.	Height above the Sea.	Oct.	Nov.	Dec.	Year.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.
	feet.													
Greenwich (mean of 34 years)	159	2·67	2·53	2·02	24·78	1·68	1·58	1·61	1·73	1·96	1·83	2·37	2·40	2·40
Truro (mean of 10 years) .	55	4·08	6·11	4·90	44·08	4·66	3·79	3·44	2·54	2·41	2·79	2·64	3·04	3·68
		1856.				1857.								
Truro (Royal Institution) .	55	4·2	3·2	5·7	39·2	4·7	2·0	4·7	..	..	..	..	..	..
Scilly Isles	..	3·38	1·34	3·64	30·04	3·64	1·72	2·97	3·24	1·57	2·00	1·88	2·21	2·40
Guernsey	123	2·6	1·6	4·9	34·0	5·1	0·5	1·6	3·6	1·3	1·8	1·3	1·2	4·5
Helston	106	6·4	2·2	4·7	37·1	4·8	1·6	4·3	4·3	2·1	1·5	3·0	2·3	3·5
Prince Town	1400	3·73	1·44	5·56	50·57	4·58	3·49	4·20	5·68	4·06	2·61	3·86	0·87	4·03
Exeter	140	2·4	1·0	3·5	29·8	2·5	2·5	4·1	..	2·2	1·7	1·9	0·2	1·3
Torquay	..	3·1	0·8	3·6	..	..	..	..	2·1	2·8	2·5	1·2	1·0	1·3
Braunton	40	3·58	1·94	4·78	34·04	3·74	1·26	3·86	3·18	1·87	1·73	4·74	0·89	3·41
Taunton	70	1·67	1·33	2·81	28·61	2·41	3·06	2·07	3·17	3·09	1·63	3·80	1·39	1·91
Otterhead	..	3·97	1·47	4·83	..	3·75	2·62	5·11	5·50	2·77	1·44	4·03	0·67	2·84
Ventnor.	150	3·5	0·8	3·1	29·4	2·3	0·3	2·1	2·0	0·9	1·4	4·6	5·3	4·3
Clifton	238	2·7	0·7	2·4	32·2	2·7	1·5	1·9	2·9	2·1	2·1	2·5	4·0	2·2
Oxford	210	1·9	0·7	1·8	29·6	3·1	0·3	1·4	2·2	1·2	2·9	3·3	2·9	3·4
Greenwich	159	1·6	1·0	1·3	21·8	2·6	0·2	0·8	1·4	0·6	2·7	1·1	2·6	3·4
Norwich	39	2·2	2·7	1·3	25·4	3·6	0·1	0·9	2·5	0·9	2·6	0·5	2·4	4·9
York	50	1·7	1·0	2·1	26·4	2·6	0·6	2·1	2·8	1·5	2·7	2·9	6·6	2·0
Isle of Man	..	3·2	2·5	5·7	34·2	..	2·4	2·9	4·4	1·4	2·1	1·0	1·5	1·5

13.—*Imports into the United Kingdom from* 1846 *to* 1856, *inclusive.* (Extracted from the Parliamentary Returns). By J. H. COTTERELL.

CHEESE and BUTTER.

Year.	Cheese.	Butter.
	cwt.	cwt.
1846	336,185	257,777
1847	355,253	314,066
1848	444,032	295,663
1849	379,648	282,501
1850	347,773	331,135
1851	338,988	354,218
1852	290,034	286,113
1853	398,892	404,194
1854	390,594	483,902
1855	385,136	448,341
1856	407,676	514,764

CORN.

Year.	Wheat.	Barley.	Oats.
	Qrs.	Qrs.	Qrs.
1846	1,437,944	440,443	772,554
1847	2,650,058	772,349	1,706,780
1848	2,594,013	1,063,912	977,761
1849	3,872,134	1,389,793	1,282,219
1850	3,754,593	1,043,051	1,165,856
1851	3,833,636	852,552	1,209,844
1852	3,068,892	626,737	995,480
1853	4,949,314	828,670	1,035,072
		Barley and Oats.	
1854	3,431,227	3,419,271	..
1855	2,667,702	3,061,539	..
		Barley.	
1856	4,072,833	731,412	1,146,848

CATTLE, SHEEP, and PIGS.

Year.	Cattle.	Sheep.	Pigs.
1846	52.562	94,567	3,448
1847	75,338	139,876	1,242
1848	62,734	130,370	2,119
1849	53,317	129,265	2,658
1850	66.462	143,468	7,287
1851	86,520	201.859	15,597
1852	73,084	230,476	10.524
1853	25,253	259,420	12,757
1854			
1855			
1856	83,306	145,059	9,916

Bath, February, 1858.

14.—*Tithe Commutation Table.*

Communicated by R. Dymond, Exeter.

The average prices of corn upon which the commutation of tithes was founded, as provided by the 'Act for the Commutation of Tithes in England and Wales,' were,—

	s.	*d.*	
Wheat	7	0¼	per imperial bushel.
Barley	3	11½	,,
Oats	2	9	,,

By the 'London Gazette' of the 8th January, 1858, it appears that the average prices for the seven years ending on the Thursday next preceding Christmas Day, 1857, have been as follows:—

	s.	*d.*	
Wheat	7	2¾	per imperial bushel.
Barley	4	3½	,,
Oats	2	11	,,

And by calculation it will be seen that for every 100*l.* of tithe rent-charge, as stated in the apportionments, the amount payable for the year 1858 will be 105*l.* 16*s.* 3½*d.*, which is more than 6 per cent. above the last year's value, and an increase of over 5 per cent. on the averages adopted for the apportionments.

The following statement, founded on Mr. Willich's 'Annual Tithe Commutation Tables,' shows that the average prices for the whole twenty-two years since the passing of the Tithe Commutation Act is 99*l.* 0*s.* 1¼*d.*, being 1 per cent. under those on which the commutation was founded:—

		£.	*s.*	*d.*
For the year 1837	..	98	13	9¾
,, 1838	..	97	7	11
,, 1839	..	95	7	9
,, 1840	..	98	15	9½
,, 1841	..	102	12	5¼
,, 1842	..	105	8	2¾
,, 1843	..	105	12	2¼
,, 1844	..	104	3	5¼
,, 1845	..	103	17	11¼
,, 1846	..	102	17	8¾
,, 1847	..	99	18	10¼
,, 1848	..	102	1	0
,, 1849	..	100	3	7¾
,, 1850	..	98	16	10
For the year 1851	..	96	11	4¾
,, 1852	..	93	16	11¼
,, 1853	..	91	13	5¾
,, 1854	..	90	19	5
,, 1855	..	89	15	8¾
,, 1856	..	93	18	1¼
,, 1857	..	99	13	7¼
,, 1858	..	105	16	3½
	22)	2178	2	6¼
General average for 22 years..		£99	0	1¼

15.—*Average Prices of Meat, Corn, and Flour.*

Compiled from the Journal of the Statistical Society. By R. Dymond, Exeter.

Average Price of Beef and Mutton per Pound and per Stone of 8 lbs., as sold by the Carcase in Leadenhall and Newgate Markets.

	Price per Pound, for 3 Months, ending				Price per Stone, for 3 Months, ending			
	Dec. 1856.	Mar. 1857.	June, 1857.	Sept. 1857.	Dec. 1856.	Mar. 1857.	June, 1857.	Sept. 1857.
	d.	d.	d.	d.	s. d.	s. d.	s. d.	s. d.
Beef—inferior ..	3¾	4½	4¼	4¼	2 6	3 0	2 10	2 10
„ middling ..	5¼	5¾	5⅝	5⅜	3 6	3 10	3 9	3 7
„ best	6¾	6¾	6½	6½	4 6	4 6	4 4	4 4
Mutton—inferior	4¾	5¼	4¾	4½	3 2	3 6	3 2	3 0
„ middling	5¾	6¼	5¾	5¾	3 10	4 2	3 10	3 10
„ best ..	6¾	7¼	6¾	7	4 6	4 10	4 6	4 8

Average Price of Grain per Imperial Quarter in England and Wales during each Quarter, for the Year ending September 26, 1857.

	Wheat.	Barley.	Oats.	Rye.	Beans.	Peas.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
Average for the Year 1856 ..	69 2	41 1	25 2	45 0	43 11	41 7
Quarter ending—						
December 27, 1856	63 4	44 7	25 6	40 9	45 2	43 1
March 28, 1857	56 10	45 8	23 5	39 7	39 11	39 5
June 27, 1857	56 0	42 6	24 9	38 11	42 3	40 9
September 26, 1857	59 11	40 2	27 3	39 8	46 3	42 5

Wheat and Wheat Flour sold in England and Wales during each Quarter, for the 12 Months ending September 30, 1857; and also the Quantities Imported and entered for Home Consumption.

	Sold in England and Wales.	Entered for Home Consumption.
	Quarters.	Quarters.
Quarter ending December 31, 1856	1,468,000	1,447,000
„ „ March 31, 1857	1,332,000	667,000
„ „ June 30, 1857	1,402,000	548,000
„ „ September 30, 1857	1,198,000	719,000
	5,400,000	3,381,000

16.—*Notes from New Books.* By the EDITOR.

VOLUME XVIII. of the Journal of the Royal Agricultural Society, though perhaps not in all respects equal to some of its predecessors, contains some very useful articles. Among those of popular and general interest on practical matters stands first an article from the West of England—Horseshoeing, by Mr. William Miles; without doubt the very best summary of the science and practice of the subject which was ever put together. So highly is it thought of that five thousand copies have been reprinted for sale to the public at 6*d.* each. But any member of the Royal Agricultural Society may receive a dozen copies for half-a-crown. No horsemaster should neglect to put it into the hands of the smith he employs, and of his groom.

Roads.

Hardly less important to the horse than his shoes is the road on which he has to work; and in the same volume are two useful papers on Road-making, by Mr. Bailey Denton, p. 82, and Road-mending by Mr. Cavendish, p. 451.

The Somerset marshmen especially should study Mr. Denton's most practical paper. The two points to secure in a good road are to make it perfectly dry, and of a right form. The first object should, if possible, be secured at least by one, but better by two, good tile drains, 4 feet deep, under each edge of the metalling, with open surface-drains about 4 or 5 feet right and left of the metalling. The second point, viz., the right form of the surface, is to be secured by making the road round, sloping both ways, or flat, sloping one way; but in all cases the form of the road must be constantly preserved by filling up ruts and hollows, so that the water shall neither have hollows to lie in nor channels to run in. Mr. H. S. Thompson also calls attention to the great importance of setting all farm gateways high enough; if this is not done the ground is sure in time to wear into a hole at the gate.

As Mr. Thompson says, no drainage will pay the farmer in clay-land so well as the drainage of his farm roads; not so much in increased receipts as in diminished expenses. Nor is this kind of draining a heavy operation. The length of drain required for a mile of road is about equal to that required to drain 2½ acres of land.

Some useful suggestions as to road-mending are given by Mr. Cavendish: the principle being to mend the road in small patches placed zigzag, so that carts and carriages, without going in a serpentine direction, cannot avoid at least working in the edges of the new layers of the stones. "When a road is worn into ruts, repair one rut at a time for some yards, the other to be repaired when the first is partially worn."

Dairy Management and Feeding of Cattle.

Under the unpretending title, Dairy Management, is one of the most remarkable papers ever penned on agricultural subjects. It shows what practical farmers might do for the advancement of their own science and practice if they would. If, instead of for ever crying up practice and crying down theory, till one is quite sick of the words, men would really become intelligent observers and recorders of facts, there is no assignable limit to the progress agriculture might make. At present we are groping in the dark chiefly for want of what practical men, as they are called, are alone capable of doing. What this is Mr. Horsfall has shown in a most remarkable manner. He has brought the resources of science to bear on the economy of the dairy, the feeding stall, the pasture field, the hay field, the muck heap, and the market; showing exactly where waste is likely to occur, when extra feeding will pay, and when it will not, and how the habits of society bear on the profit of the farmer.

It is impossible to do justice to the article by abridging, but we would say to every young farmer, Read it, and try to imitate it. Among other conclusions to which the article points, is the profit which attends the combination of the dairy with feeding cattle, and the very great extent to which the produce of milk and meat may be controlled by attending to the different qualities of food instead for ever pulling at the haystack.

Paring and Burning.

Professor Voelcker, in addition to his valuable paper on Farmyard Manure, the substance of which appeared in his Lecture in our last Journal, has contributed an important investigation on a practice well known on our western hills, that of paring and burning the surface.

He has shown that some ashes on the Cirencester farm give an amount of fine phosphate of lime equal to that in 20 bushels of bone-dust. It must not be assumed that all ashes will yield the same, but wherever the practice of farmers points to ashes as a good manure for turnips, it is worth while to have them analysed before laying out money in the purchase of bones or superphosphate. The Professor points out some useful cautions, as for example, that "paring and burning should only be used on soils containing clay. On sandy soils it is likely to do mischief." Such confirmations and explanations of existing practice as this article contains, are most valuable; they are the true basis on which to build scientific investigation; and they tend to give the practical man confidence in science.

Vegetable Physiology.

Those who are beginning to feel an interest in what science teaches of the growth of plants, will find much to repay diligent study in an article on Vegetable Physiology, by Professor Henfrey, one of the most meritorious botanists of our day, whose attention to agricultural subjects, if it meets with its due encouragement, may bear useful fruit to the farmer.

Professor Henfrey has recently published an elementary work, which is spoken of in the Philosophical Journal as an "excellent botanical text-book." *

Growth of Barley.

The volume closes with an elaborate article by Mr. Lawes and Dr. Gilbert on the growth of barley. The article is seventy pages in length, and contains, as all papers by the same authors have contained, evidence of great labour and conscientious investigation into the facts of English farming. It is, however, much to be wished that the results of these valuable efforts were given to the world in a somewhat less bulky form, and in a more attractive style: scientific subjects, no less than more familiar matters, must be conveyed to the popular ear through the pure idiom of " English undefiled." The German arrangement of words, however forcible in its native garb, is intolerable to the English ear, and produces a misty sensation of weariness mingled with impatience, which is far from conducing to clear apprehension of an author's meaning. We say this publicly, because we know how many feel it, and that Mr. Lawes and Dr. Gilbert lose much of their deserved credit in consequence.

An abstract of the important matters contained in this paper having already appeared elsewhere, we need only shortly state the object and result of the paper. It contains an account of three sets of experiments, extending over many years, having for their object to determine the best manure to be used by the English farmer for the barley crop as it occurs in rotation :—

1. Different manures were tried side by side on the same land for six successive years.

2. Barley was grown for three years in a field after ten successive crops of turnips. Different parts of this field had received certain special manures constantly year after year, and part of the field no manure at all.

3. In a third field barley was grown in its turn in the ordinary four-course rotation, extending over twelve years; but part of the field was unmanured, part of it was manured (for turnips only) with superphosphate, and part with a rich mixed manure.

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* 'Elementary Course of Botany,—Structural, Physiological, and Systematic, &c.,' by Arthur Henfrey, F.R.S., F.L.S., Professor of Botany in King's College London.

For the reader who has entered into the Lawes and Liebig controversy, and who is not saturated with nitrogenous doctrine, it may suffice to say that all these experiments support fully the conclusion that, give what you will to land, you must not omit to give nitrogen if you wish to secure a maximum barley crop as well as a maximum wheat crop. But, as regards barley, the first conclusion is modified by a second and a third: the second, that superphosphate of lime does on ordinary soils benefit barley more than wheat; the third, that barley may be, and indeed certainly will be, injured by an *overdose* of nitrogen.

For the general farmer it will not perhaps be interesting if we plunge deeper into the detail of each course of experiment, or revive the mineral ashes or the gaseous fumes of the great controversy. But we may cull a few points which throw interesting light on the farmer's daily practice.

The mere rotation of crops without manure increased the produce of barley beyond the natural produce of barley grown year after year on the same land also without manure; but a succession of turnip crops year after year without manure, so far from preparing the land to yield an increased barley crop, seems to have exhausted it.

In like manner, when the whole of a field of turnips was carted off—part of which had been unmanured, and part manured with superphosphate—the part which had been highly manured for turnips, and produced a large crop of roots, yielded the worst crop of barley. On the other hand, the highly manured turnips when fed off on the land were followed by a much larger crop of barley than the poorer crop of turnips grown without manure and also fed off on the land.

It may be said, Who would doubt it? Yes, but it is something to have the rough experiences of farmers reduced to the test of severe experiment, and rationally accounted for. We walk on firmer ground afterwards.

The practical conclusion is, "Grow as large a crop of turnips as possible with superphosphate;" but do not give too much dung nor too much manure rich in vegetable matter or nitrogen, and feed off on the land *in moderation* before barley.

Another practical conclusion incidentally results from these experiments: that on land in high condition, especially if rich in nitrogen, the barley crop may be most profitably grown immediately after the wheat crop, and that an application of superphosphate to the barley crop will then be remunerative. The effect of such mineral manure will be not only to promote the general crop, but to bring it more rapidly to maturity.

The authors thus state their opinion as to the best manure for barley:—

"Of direct portable manures for barley, Peruvian guano, or salts of ammonia, or nitrate of soda, either of them with a small quantity of superphosphate, are the best."

They recommend the application of these manures before or at the time of sowing, that they may be well distributed through the soil and near the surface:—

> "As a mere top-dressing, nitrate of soda is the best. Of the more exclusively nitrogenous manures—salts of ammonia and nitrate of soda—the nitrate acts somewhat more rapidly for a given amount of nitrogen supplied. The action of the purely nitrogenous manures is economised by admixture with a small quantity of superphosphate of lime, or other appropriate mineral manure. Other things being equal, the later the barley is sown, the less should be the proportion of nitrogen in the manure, and the greater that of mineral constituents; otherwise the crop is liable to be too luxuriant; and with a limited range of root in the soil it will probably not find mineral constituents rapidly enough in the later stages of growth for a favourable development and maturing of the seed."

Such are some of the most practical results, or, as Liebig would say, recipes, to be deduced from these laborious researches. But we are far from thinking that farmers, especially young men, should be content with empirical nostrums; they should strive to master principles.

Some very important principles are touched upon in this paper. One is the connection between the form of the roots of a crop and its manure. The roots of barley are smaller and much nearer the surface than those of wheat. This principle, if followed out, will give the farmer a thread whereon to hang all his practical observations as to the proper tillage, season, and manure for barley; also as to its quantity, and the quality of the sample. Another theoretical principle, or rather point for inquiry, is the proportion between the nitrogen supplied to the soil and the nitrogen which can by good farming be recovered again in the form of marketable produce.

First, it appears that the unaided soil at Rothamsted yielded 28 lbs. of nitrogen in the barley crop, on an average of several years. But this is more than all the nitrogen annually deposited from the heavens in rain and moisture, as far as we yet know. Where did the rest come from? Was it previously in the soil, and are we gradually using the capital locked up in the soil? Is it deposited in the soil from the atmosphere? or has the plant a power of directly imbibing nitrogen for itself from the air? We here only hint at problems of the great practical importance to which as yet science has no certain answer; but she toils steadily on.

Secondly, there is the question, "What becomes of all the nitrogen supplied in the form of manure?" Here the tables are turned the other way. Year after year a quantity of nitrogen is supplied to the soil by farmyard dung, by guano, by the animal excrements in the fold; it far exceeds what is brought home in the crop. What becomes of it all? Is it locked up in the soil, as unavailable capital, money put out at mortgage? Is it drained away or evaporated? or does the plant in forming its seed use up a certain quantity of nitrogen as sauce to its food, with nothing to show for it at harvest?

These also are questions of deepest interest. Science cannot as yet explain them; but it is something to fasten the attention of the English farmer on facts; and it is by supporting such inquiries as those of Mr. Lawes and Dr. Gilbert, and by not being in a hurry, that we are likely to get an answer to our questions.

In the 'Journal of the Society of Arts' for the last twelve months—a cheap publication, easily accessible to all interested in agriculture, arts, manufactures, and commerce—will be found many lectures and discussions interesting to intelligent agriculturists. Draining and rainfall, agricultural implements, the cottages of the poor, the agriculture of France, have furnished interesting meetings to the inhabitants of the metropolis and to its agricultural visitors.

Bread-making.

One paper, of great importance both to the producer and consumer of the food of the people, deserves especial attention. We refer to a lecture on the chemistry of bread-making, by the eminent chemist Mr. Odling, Secretary to the Chemical Society. The paper is to be found in No. 281 of the Journal Soc. Arts, April 9th, 1858. One of the points established in this lecture is that the bakers correctly estimate the value of wheat by its amount of starch, and not by its amount of gluten, as some theoretical writers have done. The whiteness of bread is shown to depend not so much on the fineness of the flour as on the power possessed by the baker of arresting changes in the starch. Not to dwell on the scientific principles explained, which hardly admit of abridgment, we arrive at the startling practical conclusion that the bakers are quite right in using a small quantity of alum, and also we are informed that lime-water has been used for the same purpose with great advantage by bakers at Glasgow.

The wholesomeness of alum in bread is an opinion maintained by some eminent physicians, and is deserving of inquiry.

There is a new process of bread-making carried on at Paris on a large scale, under the direction of M. Mège Mouries, by which process it is stated that the deterioration of starch is prevented and a great saving made. An account of the plan is given in the 'Comptes Rendus,' January 12th, 1857; in the 'Pharmaceutical Journal,' November, 1857; and a more recent account in the 'Chemist' for May, 1858.

It seems that by the employment of bran in water, with common salt, waste in fermentation and baking is prevented, the whole flour is converted into the best white bread, and economy is effected nearly equal to 1*d.* per 4-lb. loaf. If this be true, some clear practical exposition of the principle in a form suited to the habits of the English baker and of the English consumer would be a great public boon.

Rainfall and Draining.

The last number of the 'Edinburgh Philosophical Journal' contains an article on the fall of rain, by Dr. Stark, a very distinguished meteorologist. It is interesting to us who live on the western side of the island. He proposes to establish a more close connexion between the *average* fall of rain and the width between drains, observing, very truly, that no under-draining can provide for sudden thunder, showers, which must pass off over the surface.

It is well known that the winters are milder and that more rain falls on the western shore than on the east. Our devoted countryman Mr. Whitley has done much to explain the cause of this, and his opinion has obtained general acceptance—that the cause is in the warm water of the Gulf-stream which strikes our western shore. Dr. Stark does not seem to agree in this view, and apparently refers the western rains entirely to the western hills. He directs attention to some important points of inquiry and to the proper use of rain-gauges. We trust our friend Mr. Whitley, notwithstanding his overwhelming professional engagements, will find time to tell us more about these matters next year.

Respiration of Plants.

In the same Journal we read, with reference to the opinion of a French author, that the respiration and circulation of animals "have been shown to have a greater analogy than is usually supposed;" and "that the respiration of plants consists of two phenomena: 1. Absorption of carbonic acid during the day, with emission of oxygen. 2. Oxidation in the vessels at the expense of the oxygen, with the formation of carbonic acid during the day as well as during the night, but with the exhalation of this acid during the night only, because during the day it is decomposed in passing through the leaves." These views are stated not to be new, but to be fully detailed in the writings of Burnett, Carpenter, and in Balfour's 'Class Book of Botany,' p. 467. We refer to the subject only to show how necessary it is to speak cautiously on the functions and organisation of plants and animals.

With the same feeling reference may be made to a recent paper of Liebig's on some properties of the soil. He follows in the track of Professor Way, and apparently does not add much to the views of our countryman as to the power of the soil to retain some of the soluble elements of manure in a state which, if not insoluble, is at least capable of resisting the influence of drainage through the soil. This tends to throw doubt on the opinion hitherto held that plants receive all their food in solution, and suggests the inquiry whether plants do not pick and choose their food out of the solid soil by some inherent vital agency —no impossible conclusion, if decided in the affirmative, but a remarkable one for Liebig to have come round to.

The paper is translated in the Journal of the Chemico-Agricultural Society of Ulster, No. XII., January, 1858, and following numbers.

A private letter from Baron Liebig to Dr. Daubeny explaining his views is published in the Quarterly Journal of the Chemical Society for May, 1858, in which the Baron says :—

> "The inference deducible from my experiments is that land plants do not receive their food from a solution of the ingredients already present in the soil, but that they abstract or absorb it directly from the soil itself through the joint agency of water and of a force inherent in their roots. It has hitherto been assumed that a plant possessed a decomposing power as well as a secreting one. . . . . This power does not exist. . . . . The salts are decomposed by the soil, and the plants all receive their food from elements in the same state of combination. . . . . The experiments of Way constitute the foundation of a new theory of vegetable nutrition."

Dr. Daubeny's Lectures on Sewage.

It is with great regret that we are obliged to do no more than allude to two valuable lectures delivered by Dr. Daubeny at Oxford on the subject of sewage, summing up the results of many attempts and investigations on this important subject. They were printed in the 'Oxford Chronicle' of February 6th and February 13th, 1858. With Dr. Daubeny's accustomed sound judgment, he rather points out the vast importance of the fertilizing matter lost in sewage than encourages the agriculturist at present to reckon on the profitable use of it till difficulties yet unsolved are disposed of.

On Teaching Botany and Physiology.

Professor Henslow of Cambridge, one of the Examiners for the West of England Prizes in 1857, has completed a most valuable series of Botanical Diagrams * for the teaching of Botany to the young; and a series of 'Illustrations, to be employed in Practical Lessons on Botany, adapted to Beginners of all Classes. Prepared for the South Kensington Museum.' London: Chapman and Hall. Price Sixpence.

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* Nine Coloured Botanical Diagrams, prepared by Professor Henslow, and drawn by W. Fitch, for the Department of Science and Art. Sold by Messrs. Day, 6, Gate Street, Lincoln's-Inn Fields.

On the subject of Physiology, the following may perhaps be accepted as a contribution of a Westcountryman to one most important department of agricultural instruction.

The elements of Physiology having been taught in a school, and an examination held by the teacher, Mr. Griffiths, the papers were sent to Dr. Acland for inspection, with three questions, which, together with Dr. Acland's answers, are here given :—

Oxford, Dec. 22, 1857.

Sir,—I will answer your three questions in order:—

I. What I think of the Physiological Papers which you have sent to me from Magdalen School?

I think them both honourable to you as the teacher, and creditable to the boys as your pupils. The answers, marked A and B respectively, deserve especial commendation: the *drawings* in A, when superadded to the carefulness of the answers, ought to be particularly noticed. I should wish some distinct Hygienic question to be set on another occasion.

II. Whether I think that Physiological instruction is desirable in schools:—

I would answer, first, That Government is actually introducing it into the lower schools, and that Professor Henslow, Mr. Combe, and others, are earnestly pressing it on the public attention; and, secondly, That in the present state of education in the country, every school may be called on to decide whether to introduce Physiological teaching or not. I have no doubt but that the former is by much the better alternative, because,—

1. A knowledge of some part of the material world is become almost necessary, either on account of its practical use, or for the sake of its discipline: it is, therefore, a loss and a misfortune for those who have no means placed within their reach for acquiring such knowledge. With respect to Physiology in particular, it may be said to be the highest and richest of the organic sciences.

2. Religious minds of all ages have, according to their opportunities, delighted in and profited by a study of Nature. In Physiology are found some of the most remarkable examples of Design, Contrivance, and Law.

3. Physiological study exercises the powers of observation, of attention, and of memory, in a remarkable manner, and to a degree which persons ignorant of it do not understand.

4. It affords, in common with other natural sciences, one of the best means for teaching Method and Classification.

5. General Physiological questions will in a few years become

so universally understood, that much ordinary literature will be unintelligible to those wholly unacquainted with them. Advanced Physiological problems are already discussed in Reviews, in this and other countries. Sanitary inquiries of all kinds come now within the range of town-councils, vestries, guardians, police, registrars, and officials in every class of society. *Cæteris paribus*, therefore, one versed in such subjects, or intelligently grounded in them, is better prepared for office than one who is not.

6. The standard of medical knowledge and medical practice will be raised in proportion to the diffusion of Physiological knowledge among the general public. I look, therefore, to the increase of a general knowledge of Physiology (and of Hygiene, which it implies), as one of the greatest benefits which will accrue through science to the temporal interests of mankind. Every form of quackery and imposture in medicine will in this way, and in this way only, be discouraged. It is, in great part, on this ground—on the ground of the future benefit to the people through the dissemination of a true perception of the *groundwork* of Practical Medicine—that I have laboured for many years to promote Physiological knowledge in this University among students holding whatever rank and destined for whatever occupation.

7. Probably no kind of literary composition will lead more to precision of thought and statement than the early habit of describing correctly natural objects. This has an obvious bearing on various competitions for public appointments.

8. It remains only to say, whether I know any objection to beginning these studies at school. I know no objection which cannot be met.

Of course there are some objections to every plan of education. The most serious that I have heard to the introduction of Natural History studies is, that children have not *time*. I am so satisfied that, speaking generally, linguistic and mathematical studies are of more value than any others as instruments of intellectual discipline, that if I thought that scientific studies (I need not here speak of the studies of the Arts) would either supplant or injure the culture of youth by means of them, or *if I thought the hours of vigorous play and manly freedom would be abridged*, I never should have advocated this addition.

In this matter, however, the truth is often unperceived. Training by language and calculation may be combined with, and make part of scientific teaching: without precision of ideas and accurate expression, true physiological science does not exist, and can neither be taught nor learnt. That this is so, will appear more and more as time goes on;—the ideas and the language, of even my own hitherto most loosely-worded Art, become every year more definite and significant; its dogmas are becoming either precise or worthless. I must allow, however, that the ideas, and consequently the nomenclature of science, are not, and cannot be, absolutely fixed; and so far, science must always be a less perfect aid to instruction than the ancient Greek language.

These questions could only be discussed in an essay: I therefore, for the practical purpose of to-day, answer,—

III. As to the way in which Physiology is to be taught in your school:

1. For the sake of precision in a subject which contains, necessarily, many doubtful points, introduce, where you can, precise definitions and numerical calculations. You may find many opportunities in dimensions, micrographic and others,—in weights, in algebraic formulæ, &c.

2. For the study of external characters, encourage the collection of the Fauna and Flora of the neighbourhood; including, in the case of older boys, microscopic species.

For the study of organs and of functions, show dissections where you can. A rabbit, a rat, a sparrow, a frog, a perch, a snail, a bee, an earth-worm, and, if you have a microscope, a few infusoria, will enable you, at any time of the year, to show some of the most important types of structure in the animal kingdom.

3. Encourage the boys to put up microscopic objects. The minute manipulation will give neatness and precise habits. Little apparatus is required; and no mess need be made.

4. Write, or have written by some first-rate hand, precise osteological Monographs for boys, of the skeletons of the cat, the mole, the pigeon, the frog, the common snake, and the perch; and get some school-society to publish such a text-book, and to supply *objects* instead of *plates*. To master them would be a capital exercise of close attention, of some thought, and of practical powers of comparison. They would be more costly, but more durable also, than plates. Mr. Robertson, at the Christ Church Museum, Oxford, or Mr. Flower, at the College of Surgeons, London, would get these prepared in any number, and at the smallest cost which would pay the expenses. The Kensington Museum would doubtless exhibit such a series, with the explanatory volume.

I am, Sir, faithfully yours,

HENRY W. ACLAND.

G. GRIFFITH, ESQ.,
Magdalen College School.

UNIVERSITY OF OXFORD.

REGULATIONS FOR CARRYING INTO EFFECT THE STATUTE "CONCERNING THE EXAMINATION OF THOSE WHO ARE NOT MEMBERS OF THE UNIVERSITY."

EXAMINATION FOR THE YEAR 1858.

The Examination will commence on Monday the 21st of June, 1858.

Junior and Senior Candidates will be examined at the same time; but the Papers for the two Examinations will be different.

EXAMINATION OF JUNIOR CANDIDATES.

(For Certificates.)

Candidates must be under 15 years of age on the day when the Examination begins.

I. All Candidates at this Examination will be required to satisfy the Examiners in

1. Reading aloud a passage from Southey's Life of Nelson.
2. Writing from Dictation.
3. The analysis and parsing of a passage taken from Goldsmith's Deserted Village.

   A few questions will also be set on the allusions, &c. in the Poem.
4. Writing a short English Composition, such as a description of a place, an account of some useful natural or artificial product, or the like.
5. Arithmetic.

   No Candidate will be passed who cannot work the first four rules simple and compound, whatever may be his excellence in other respects.

6. Geography.

Every Candidate will be required to draw from memory an outline Map showing the coast line, the chief ranges of mountains, and the chief rivers of some country to be named by the Examiners from the following list:—

England, Scotland, Ireland, Europe, Asia, Africa, North America, South America, Australasia.

Questions will also be set in Geography.

7. The outlines of English History: that is, the succession of Sovereigns, the chief events, and some account of the leading men, in each reign.

N. B.—The quality of the handwriting in the several Exercises will be taken into account.

* II. The Examination in the Rudiments of Faith and Religion will consist of questions in

1. The Books of Genesis and Exodus, the Gospel of St. Matthew, and the Acts of the Apostles.
2. The Catechism, the Morning and Evening Services, and the Litany.

III. Papers will also be set in the following eight subjects; and every Candidate will be required to offer himself for Examination in one subject at least; but no Candidate will be examined in more than four;—

1. Latin.

A passage will be given from Cæsar de Bello Gallico, (Books I. II. III.) for translation into English, with questions on the parsing, and the historical or geographical allusions.

An easy passage for translation from some other Latin book.

A passage of English (with the Latin words supplied) for translation into Latin.

2. Greek.

A passage will be given from Xenophon's Anabasis, (Books I. II.) for translation into English, with questions on the parsing, and the historical or geographical allusions.

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* This Examination will not be required of any Candidate whose Parents or Guardians shall have declined it on his behalf.

An easy passage for translation from some other Greek book.

3. French.

A passage will be given from Voltaire's Charles XII., with questions on the parsing, and the historical or geographical allusions.

A passage from a French Newspaper for translation into English.

English sentences for translation into French.

4. German.

A passage will be given from Schiller's Revolt of the Netherlands, with questions on the parsing, and the historical or geographical allusions.

A passage from a German Newspaper for translation into English.

English sentences for translation into German.

5. Mathematics.

Euclid, Books I. II.

Arithmetic.

Algebra to Simple Equations inclusive.

This amount of knowledge will enable a Candidate to pass in this subject.

Questions will also be set in Euclid, Books III. IV. VI., in Quadratic Equations, Progressions, and Proportion, Plane Trigonometry not beyond the Solution of Triangles, the use of Logarithms, Mensuration, and Practical Geometry.

6. Mechanics and Mechanism.

The questions on Mechanics will be chiefly of a practical character, and will not extend beyond the Parallelogram of Forces, the Centre of Gravity, and the Mechanical Powers.

The questions on Mechanism will be confined to the Mechanism of the Steam Engine.

The answers must be illustrated by diagrams or drawings.

Great importance will be attached to good drawing.

7. Chemistry.

Questions will be set on the elementary facts of Chemistry.

Solutions will be given to be tested, containing each not more than one acid and one base.

8. Botany and Zoology.

Questions will be set on the Classification of Plants and Animals, their uses, and Geographical distribution.

British Plants and parts of Plants will be given for description.

IV. Candidates may also offer themselves for examination in

1. Drawing from the Flat, from Models, from Memory, and in Perspective.
2. In the grammar of Music.

The names of the successful Candidates will be arranged in three Divisions: those in the first Division will be placed in the order of merit; those in the second and third Divisions alphabetically.

After each successful Candidate's name will be inserted his Age, the place of his Residence, and the School (if any) from which he comes to attend the Examination.

The Certificate given to each successful Candidate will specify the subjects in which he has satisfied the Examiners.

The fact that a Candidate has passed the Examination in the Rudiments of Faith and Religion will be entered on his Certificate, although it will not affect his place on the List.

EXAMINATION OF SENIOR CANDIDATES.

(*For the Title of Associate in Arts.*)

Candidates must be under Eighteen years of age on the day when the Examination begins.

I. All Candidates at this Examination will be required to satisfy the Examiners in

1. Analysis of English sentences and parsing, and correction of faulty sentences.
2. A short English composition.
3. Arithmetic.

4. Geography.

   Every Candidate will be required to draw from memory an outline Map of some country in Europe to be named by the Examiners, showing the boundary lines, the chief ranges of mountains, the chief rivers, and the chief towns.

   Questions will also be set in Geography.

5. The outlines of English History: that is, the succession of Sovereigns, the chief events, and the characters of the leading men in each reign.

*II. The Examination in the Rudiments of Faith and Religion will consist of questions in

1. The Historical Scriptures of the Old Testament to the Death of Solomon.
2. The Gospels of St. Matthew and St. John, and the Acts of the Apostles.

   Those who offer themselves for examination in Greek will be expected to answer questions on the same parts of the Greek Testament.

3. The Catechism, the Morning and Evening Services, and the Litany; and the outlines of the History of the Book of Common Prayer.

III. Every Candidate will also be required to satisfy the Examiners in two at least of the Sections marked A, B, C, D; or in one of those four and in one of those marked E, F.

SECTION A.—*English*.

This will include questions in

1. English History, from the battle of Bosworth Field to the Restoration; and the outlines of the History of English Literature during the same period.
2. Shakspeare's King Lear, and Bacon's Essays.
3. The outlines of Political Economy and English Law.

   The Examination will not extend beyond the subjects treated of in the first book of Smith's Wealth of Nations, and the first volume of Blackstone's Commentaries.

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* This Examination will not be required of any Candidate whose Parents or Guardians shall have declined it on his behalf.

4. Physical, Political, and Commercial Geography.

A fair knowledge of one of these four classes of subjects will enable a Candidate to pass in this Section.

SECTION B.—*Languages.*

1. Latin.
2. Greek.
3. French.
4. German.

A fair knowledge of one of these languages will enable a Candidate to pass in this Section.

SECTION C.—*Mathematics.*

1. Pure Mathematics.
2. Practical Mechanics (including Mechanism) and Hydrostatics mathematically treated, Surveying, and Navigation.

Algebra to the end of Quadratic Equations and Four Books of Euclid will enable a Candidate to pass in this Section.

SECTION D.—*Physics.*

1. Natural Philosophy.

   Great importance will be attached to good Mechanical drawing.

2. Chemistry.

   Questions will be set on the facts and general principles of Chemical Science.

   There will be a practical examination in the elements of Analysis.

3. Vegetable and Animal Physiology.

   Questions will be set on Vegetable Physiology in general, and on the functions of Vertebrata in Animal Physiology.

   Parts of plants and bones of Vertebrata will be given for description.

   Great importance will be attached to good Botanical and Anatomical Drawing.

   A fair knowledge of one of these classes of subjects will enable a Candidate to pass in this Section; but in all cases a practical acquaintance with the subject-matter will be indispensable.

SECTION E.—*Drawing and Architecture.*

1. Drawing from the Flat, from Models, from Memory and in Perspective; and Drawing of Plans, Sections, and Elevations.
2. Design in pen-and-ink, and in colour.
3. The History and Principles of the Arts of Design.

A fair degree of skill in free-hand drawing will be required in order that a Candidate may pass in this Section.

SECTION F.—*Music.*

1. The Grammar of Music.
2. The History and Principles of Musical Composition.

The Elements of Thorough Bass will be required in order that a Candidate may pass in this Section.

Separate lists of those who distinguish themselves will be published for each of the Sections A, B, C, D, E, F, arranged in two Divisions.

The names in each First Division will be arranged in order of merit; those in each Second Division alphabetically.

The names of the other successful Candidates will be printed in a general alphabetical List.

After each successful Candidate's name will be inserted his Age, the place of his Residence, and the School (if any) from which he comes to attend the Examination.

Every Candidate who passes will receive the Vice-Chancellor's Certificate conferring the title of Associate in Arts, and specifying the subjects in which he has satisfied the Examiners.

The fact that a Candidate has passed the Examination in the Rudiments of Faith and Religion will be entered on his Certificate, although it will not affect his place on the List.

Place of Examination.

The Examination will be held in Oxford, and simultaneously in other places, if it be requested, and found expedient.

Local Committees wishing to have an Examination held in their several districts may obtain all necessary information from the Rev. J. E. SEWELL, New College, Oxford.

Time of applying.

Candidates desirous of being examined at Oxford must apply on or before the Tenth of April, 1858.

Local Committees desirous of having Examinations held in their several districts must apply on or before the 1st of March, 1858, specifying the probable number of their Candidates.

The names of these Candidates must be transmitted to the Rev. J. E. SEWELL on or before the 10th of April, 1858.

Fees.

Every Candidate at the Junior Examination will be required to pay a Fee of 10*s*.

Every Candidate at the Senior Examination will be required to pay a Fee of 30*s*.

These Fees must be paid on or before the 10th of April, 1858.

J. E. SEWELL, Honorary Secretary.

Oxford, November 12, 1857.

UNIVERSITY OF CAMBRIDGE.

REGULATIONS FOR THE YEAR 1858 CONCERNING THE EXAMINATION OF STUDENTS WHO ARE NOT MEMBERS OF THE UNIVERSITY.

THERE will be two Examinations, commencing on Tuesday, December 14th, 1858: one for Students who are under 16 years of age, and the other for Students who are under 18 years of age.

Students will be examined in such places as the Syndics, appointed by the University, may determine.

After each Examination the names of the Students who pass with credit will be placed alphabetically in three honour classes, and the names of those who pass to the satisfaction of the Examiners, yet not so as to deserve honours, will be placed alphabetically in a fourth class. After the name of every Student will be added his place of residence, and the school (if any) from which he comes to attend the Examination.

In determining the classes, account will be taken of every part of the Examination; but no credit will be given for knowledge in any subject, unless the Student shows enough to satisfy the Examiners in that subject. Regard will be paid to the handwriting and spelling throughout the Examinations.

The Students who pass with credit, or satisfy the Examiners, will also be entitled to receive Certificates to that effect. Every Certificate will specify the subjects in which the Student has passed with credit, or satisfied the Examiners, and the class in which his name is placed.

Every one admitted to Examination will be required to pay a fee of twenty shillings.

EXAMINATION OF STUDENTS WHO ARE UNDER 16 YEARS OF AGE.

Students must be under 16 years of age on the day when the Examination begins.

PART I. PRELIMINARY.

Every Student will be required to satisfy the Examiners in

1. Reading aloud a passage from some standard English prose author.
2. Writing from Dictation.

3. The analysis and parsing of a passage from some standard English author.
4. The first four rules of Arithmetic, simple and compound Vulgar Fractions, Practice, and the Rule of Three.
5. Geography:

Every Student will be required to answer questions on the subject, and to draw from memory an outline map showing the coast-line, the chief ranges of mountains, and the chief rivers of one of the countries in the following list:

England, Scotland, Ireland, Europe, Asia, Africa, North America South America, Australasia.

6. The outlines of English History since the Conquest; that is, the succession of Sovereigns, the chief events, and some account of the leading men in each reign.

Part II.

The Examination will comprise the subjects mentioned in the following ten Sections, and every Student will be required to satisfy the Examiners in three of those Sections at least, but no one will be examined in more than six. Section I. must be one of the three, unless the parents or guardians of the Student object to his examination in that Section.

1. Religious knowledge:

Questions will be set on

(*a*) The two Books of Samuel, the Gospel of St. Matthew, and the Acts of the Apostles;
(*b*) The Church Catechism;
(*c*) Whately's *Easy Lessons on Christian Evidences.*

Every Student who is examined in this Section will be required to satisfy the Examiners in the subject marked (*a*), and in one at least of the subjects marked (*b*) and (*c*).

2. English:

Every Student who is examined in this Section will be required to write an original English composition.

He will also be examined in

English History, from the battle of Bosworth Field to the Restoration;
Physical, Political, and Commercial Geography;
Trench, *On the Study of Words.*

3. Latin:

Passages will be given from Sallust's *Bellum Catilinarium* and

Virgil's *Æneid*, Book vi., for translation into English, with questions on the parsing and the historical and geographical allusions;

Also an easy passage for translation from some other Latin author;

And a passage of English, with Latin words supplied, for translation into Latin.

4. Greek:

Passages will be given from Xenophon's *Anabasis*, Book ii., and Homer's *Iliad*, Book vi., for translation into English, with questions on the parsing and the historical and geographical allusions;

Also an easy passage for translation from some other Greek author.

5. French:

Passages will be given from Voltaire's *Charles XII.*, for translation into English, with questions on the parsing and the historical and geographical allusions;

Also a passage from some modern French author for translation into English;

And easy English sentences for translation into French.

6. German:

Passages will be given from Lessing's *Fables*, Prose and Verse, for translation into English, with questions on the parsing;

Also a passage from some modern German author for translation into English;

And easy English sentences for translation into German.

7. Pure Mathematics:

Every Student who is examined in this Section will be required to satisfy the Examiners in Euclid, Books i. and ii., Arithmetic, and Algebra to simple Equations inclusive.

Credit will be given for a knowledge of Book-keeping.

Questions will also be set in Euclid, Books iii., iv., and vi., in Quadratic Equations, Progressions, Proportion, Plane Trigonometry not beyond the solution of Triangles, the use of Logarithms and Mensuration.

8. The elementary principles of Mechanics and Hydrostatics:

Questions will be set, embracing the proofs of the leading Propositions.

In Mechanics they will not extend beyond the parallelogram of forces, the centre of gravity, and the mechanical powers.

In Hydrostatics they will not extend beyond the transmission of fluid pressure, the equilibrium of inelastic fluids and of floating bodies, and the description of the steam-engine and of simple hydraulic machines.

A fair knowledge of Mechanics will enable a Student to pass in this Section.

9. Chemistry:

Questions will be set on the elementary facts of Chemistry and the laws of chemical combination.

Solutions will be given to be tested, containing not more than one acid and one base.

10. Zoology and Botany:

Elementary questions will be set on the description and classification of Animals, their habits and geographical distribution; and on the mercantile and industrial uses of animal products;

Also on the description and classification of Plants, their uses and geographical distribution;

British plants and parts of plants will be given for description.

PART III.

Students may also offer themselves for Examination in

1. Geometrical and Mechanical Drawing.
2. Drawing from the Flat, from Models, from Memory, and in Perspective.
3. The Grammar of Music.

EXAMINATION OF STUDENTS WHO ARE UNDER 18 YEARS OF AGE.

Students must be under 18 years of age on the day when the Examination begins.

PART I.—PRELIMINARY.

Every Student will be required to satisfy the Examiners in

1. Reading aloud a passage for some standard English poet.
2. Writing from Dictation.
3. Analysis of English sentences and parsing.
4. Writing a short English composition.
5. The principles and practice of Arithmetic.
6. Geography:

Every Student will be required to answer questions on the subject and to draw from memory an outline map of some country in Europe, showing the boundary lines, the chief ranges of mountains, the chief rivers, and the chief towns.

7. The outlines of English History; that is, the succession of Sovereigns, the chief events, and some account of the leading men in each reign.

PART II.

The Examination will comprise the subjects mentioned in the following eight sections; and every Student will be required to satisfy the Examiners in three at least of the sections marked A, B, C, D, E, F; or in two of them, and in one of the sections marked G, H: but no one will be examined in more than five. Section A must be taken by every Student, unless his parents or guardians object to his examination in that section.

SECTION A.

Religious knowledge:

The Examination will consist of questions in

1. The Historical Scriptures of the Old Testament to the death of Solomon.
   The Gospel of St. Luke and the Acts of the Apostles: credit will be given for a knowledge of the original Greek.
2. The Morning and Evening Services in the Book of Common Prayer; and the Apostles' Creed.
3. Paley's *Horæ Paulinæ*.

Every Student, who is examined in this section, will be required to satisfy the Examiners in the subject marked 1, and in one at least of the subjects marked 2 and 3.

SECTION B.

1. English History, from the battle of Bosworth Field to the Restoration; and the outlines of English Literature during the same period.
2. Shakspeare's *Julius Cæsar* (Craik's edition).
3. The outlines of Political Economy and English Law:

The Examination will not extend beyond the *subjects* treated of in the first book of Smith's *Wealth of Nations*, and the first volume of Blackstone's *Commentaries*.

4. Physical, Political, and Commercial Geography.

A fair knowledge of one of these four divisions will enable a Student to pass in this section.

SECTION C.

1. Latin:

Passages will be given from Livy, Book xxi., and Horace, *Odes*, Book iii., for translation into English, with questions on the historical and geographical allusions, and on Grammar;

Also passages for translation from some other Latin authors;

And a passage of English for translation into Latin.

2. Greek:

Passages will be given from the *Olynthiacs* of Demosthenes, and the *Alcestis* of Euripides, for translation into English, with questions on the historical and geographical allusions, and on Grammar;

Also passages for translation from some other Greek authors.

3. French:

Passages will be given from La Bruyère's *Characters*, and Molière's *Misanthrope*, for translation into English, with questions on Grammar;

Also passages from some other French authors for translation into English;

And a passage of English for translation into French.

4. German:

Passages will be given from Schiller's *History of the Revolt of the Netherlands*, and Goethe's *Hermann and Dorothea*, for translation into English, with questions on the historical and geographical allusions, and on Grammar;

Also passages from some other German authors for translation into English;

And a passage of English for translation into German.

A fair knowledge of one of these four languages will enable a Student to pass in this section.

SECTION D.

Every Student, who is examined in this section, will be required to satisfy the Examiners in

Euclid, Books i., ii., iii., iv., vi., and xi. to Prop. 21, inclusive.

Arithmetic and Algebra.

Questions will also be set in the following subjects:

Plane Trigonometry, including Land-surveying.

The simpler properties of the Conic Sections.

The elementary parts of Statics, including the equilibrium of forces acting in one plane, the laws of friction, the conditions of stable and unstable equilibrium, and the principle of virtual velocities.

The elementary parts of Dynamics, namely, the doctrines of uniform and uniformly accelerated motion, of projectiles and collision.

The elements of Mechanism.

The elementary parts of Hydrostatics, namely, the pressure of elastic and inelastic fluids, specific gravities, floating bodies, and the construction and use of the more simple instruments and machines.

The elementary parts of Optics, namely, the laws of reflection and refraction of rays at plane and spherical surfaces (not including aberrations), lenses, the phenomena of vision, the eye, microscopes, and telescopes.

The elementary parts of Astronomy, so far as they are necessary for the explanation of the more simple phenomena, together with descriptions of the essential instruments of an Observatory; and Nautical Astronomy.

SECTION E.

1. Chemistry:

Questions will be set on the facts and general principles of Chemical science.

There will also be a practical examination in the elements of Analysis.

2. The experimental laws and elementary principles of Heat, Magnetism and Electricity.
3. The elementary principles of Physical Optics according to the Undulatory Theory, and Acoustics, with descriptions of the fundamental experiments.

A fair knowledge of Inorganic Chemistry, or of one of the divisions 2 and 3, will enable a Student to pass in this section.

SECTION F.

1. Comparative Anatomy and Animal Physiology:

The Examination will be confined to the active and passive organs of locomotion.

2. Botany, and the elements of Vegetable Physiology.
3. Physical Geography and Geology:

Explanations of Geological terms will be required, and simple questions set respecting stratified and unstratified rocks, the modes of their formation, and organic remains.

A fair knowledge of one of these three divisions, including a practical acquaintance with specimens, will enable a Student to pass in this section.

SECTION G.

Drawing from the Flat, from Models, from Memory, and in Perspective; and Drawing of Plans, Sections, and Elevations.

Design in pen and ink, and in colour.

A fair degree of skill in free-hand drawing will be required in order that a Student may pass in this section.

Questions also will be set on the history and principles of the arts of Design.

SECTION H.

The Grammar of Music.

The history and principles of Musical Composition.

A knowledge of the elements of Thorough Bass will be required, in order that a Student may pass in this section.

Local Committees, wishing to have examinations held in their several districts, may obtain all necessary information from the Vice-Chancellor of the University.

Applications on behalf of Students desiring to be examined at Cambridge must be made on or before November 1, 1858.

Applications from Local Committees for examinations to be held in their districts must be made on or before October 1, and the probable number of Students to be examined must be then stated. The names of such Students must be sent to the Vice-Chancellor on or before November 1, 1858, together with statements of the subjects in which they will offer themselves for examination.

The fees for all Students must be paid on or before November 1, 1858.

H. PHILPOTT, *Vice-Chancellor.*

Cambridge, March 25, 1858.

BATH AND WEST OF ENGLAND SOCIETY

FOR THE ENCOURAGEMENT OF

Agriculture, Arts, Manufactures, and Commerce.

ESTABLISHED 1777.

RULES.

I. The Society shall consist of a President, Vice-Presidents, Council, Treasurer, Secretary, Governors, and Members, and shall have the following objects:—

1st. To hold meetings in the West of England for the exhibition of breeding stock, agricultural implements, and such other articles connected with agriculture, arts, manufactures, or commerce, as may be determined upon by the Council.

2nd. To offer premiums for essays and reports on subjects affecting the agriculture of the West of England, and to publish a Journal for circulation.

II. The West of England shall be divided into two districts, to be called the Eastern and Western.

III. The boundary line separating Devon from Somerset and Dorset shall be the division of such districts.

IV. The Council shall consist of a president, vice-presidents, and forty-eight other members (twenty-four of whom shall retire annually by rotation, but shall be eligible for re-election), and shall be elected by the whole body of members. One half of the Council, exclusive of the president and vice-presidents, shall be chosen from persons residing or representing property in the Eastern District, and the other half from persons residing or representing property in the Western District.

V. The election of President and Council shall take place at the annual meeting; and they shall enter into office at the conclusion of the annual meeting at which they have been chosen. The Council shall have power to nominate Vice-Presidents, and fill up such vacancies in their own body as may from time to time occur during the interval between the annual meetings.

VI. The entire management of the Society, including the power of making by-laws, of settling the prizes to be awarded, of nominating the committees, fixing the places of meetings, of appointing or removing the Treasurer, Secretary, and such other officers as may be required to carry on the business of this Society, shall be vested in the Council, who shall report their proceedings at the annual meeting to be held alternately in the Eastern and Western Districts, and submit them to the meeting for confirmation.

VII. The meetings for exhibitions shall be held in different towns in successive years, alternately in each district.

VIII. Every subscriber of 1*l.* annually shall be a member; of 2*l.*, a governor, and eligible for election as a vice-president; and every yeoman and tradesman subscribing 10*s.* and upwards annually shall be a member of the Society; and all shall be deemed such, and liable to pay their subscription, until they shall give notice in writing to the Secretary of their intention to withdraw. The subscriptions to become due and be paid in advance on the 1st of January in each year.

IX. The payment of 10*l.* in one sum shall constitute a member for life.

X. To entitle a member to exhibit, he must have been a member for six months, and have paid his subscription at least one month previous to the day of exhibition. Non-members will be permitted to exhibit stock, agricultural implements, or other articles, on payment of such a sum as the Council shall direct.

XI. Entries must be sent to the Secretary at least *sixty-two days* previous to the day of exhibition; who, upon their reception, shall forward by post printed forms of certificates to each exhibitor, which shall be filled up by him and returned to the Secretary at least *forty-eight days* previous to the day of exhibition.

XII. Members will be admitted to the exhibition without charge, by tickets (not transferable) to be issued by the Council; and other persons will be admitted on payment of such a sum as the Council shal direct.

XIII. The annual meetings of the Society shall be held in the months of May or June.

XIV. That if it be proved to the satisfaction of the Council that any person has attempted to gain a prize in this or any Agricultural Society by a false Certificate, or by a misrepresentation of any kind, such person shall thereupon be excluded from again exhibiting in this Society.

XV. All prizes shall be open for competition to the United Kingdom. But no exhibitor of stock, or person intending to compete for any of the Society's prizes, shall be privy to the selection of judges to award the premiums.

XVI. The proceedings of the Society, including the Prize Reports and List of Members, shall be printed annually, and every subscriber not in arrear with his subscription shall be entitled to receive one copy, free of expense, and there shall be an additional number printed for sale.

XVII. No new rule shall be proposed, or existing one altered or rescinded, excepting at an annual meeting, and then only provided a statement in writing shall have been sent to the Secretary at least twenty-eight days previously, setting forth the rule to be proposed, rescinded, or altered; and in the last case the proposed alteration shall be stated.

XVIII. No subject or question of a political tendency shall ever be introduced at any meeting of this Society.

List of Officers.

1857-1858.

PATRON.

THE MOST NOBLE THE MARQUIS OF LANSDOWNE.

VICE-PATRONS.

THE DUKE OF BEDFORD.
THE EARL OF MOUNT EDGECUMBE.
THE EARL FORTESCUE.
THE LORD PORTMAN.

PRESIDENT

FOR THE YEAR ENDING JUNE, 1857.

LORD COURTENAY, Powderham Castle, Exeter.

VICE-PRESIDENTS.

ASHBURTON, LORD.
ACLAND, SIR THOMAS DYKE, Bart.
ACLAND, SIR P. P. F. P., Bart.
ADDINGTON, THE HON. W. W.
BOUVERIE, THE HON. P. PLEYDELL.
BUCK, COL.
CAREW, W. P.
CLINTON, LORD.
COCKBURN, SIR W. S. R., Bart.
DUNGARVAN, LORD.
DAVIE, SIR H. R. F., Bart., M.P.
DEVONSHIRE, DUKE OF.
DUCKWORTH, SIR J. T. B., Bart.
DRAKE, SIR TRAYTON, Bart.
DICKINSON, F. H., Esq.
DIVETT, E., Esq., M.P.
DURANT, R., Esq.
EBRINGTON, LORD, M.P.
FORTESCUE, EARL.
FULFORD, B., Esq.
GRAY, BENJAMIN, Esq.
GRENVILLE, RALPH NEVILLE, Esq.
HEATHCOTE, J., Esq., M.P.
HAYTER, W. G., Esq., M.P.
HORNER, REV. JOHN.
HIPPISLEY, JOHN, Esq.
KENNAWAY, SIR JOHN, Bart.
KNYFTON, T. T., Esq.
LOPES, SIR M., Bart.
LOVELACE, EARL OF.
LABOUCHERE, THE RIGHT HON. H., M.P
LANGTON, W. H. P. GORE, Esq., M.P.
MOODY, C. A., Esq., M.P.
MILES, WM., Esq., M.P.
NORTHCOTE, SIR S. H., Bart.
NEELD, JOSEPH, Esq., M.P.
PICKWICK, MAJOR.
PINNEY, WILLIAM, Esq., M.P.
ST. GERMANS, EARL OF.
SANFORD, E. A., Esq.
SCOBELL, CAPT. R.N.
SILLIFANT, JOHN.
THROCKMORTON, SIR R. S., Bart.
WHELER, SIR TREVOR, Bart.
WAIT, WILLIAM SAVAGE, Esq.
WILTSHIRE, JOHN, Esq.

LORD WARDEN of the STANNARIES.
The SURVEYOR-GENERAL of the DUCHY of CORNWALL.
The RECEIVER-GENERAL of the DUCHY of CORNWALL.

COUNCIL. (1857-1858.)

Eastern Division.

Elected.	*Name.*	*Address.*
1856	ADAIR, D.	Heatherton, Taunton
1857	ANDREWS, G. H.	Rimpton, Sherborne
1857	BAILWARD, JOHN	Horsington, Wincanton
1856	BEAN, H. L.	Ashcott
1857	BULLOCK, GEORGE	North Coker, Yeovil
1856	COTTERELL, J. H.	Bath
1856	DANGER, THOMAS	Huntstile, Bridgwater
1856	DOWDING, E.	Bath
1856	GRAY, JOHN	Kingweston, Somerton
1856	GRAY, JONATHAN	St. John's Wood, London
1857	GILLETT, W. E.	Taunton
1857	HANCOCK, J. D.	Halse, Taunton
1856	HOLE, JAMES	Knowle, Dunster
1856	KING, J. WEBB	Chilton Polden, Bridgwater
1856	KING, R. K. M.	Walford, near Taunton
1856	KNOLLYS, I. E.	Fitzhead, Taunton
1857	LUSH, JOSEPH	Bruton
1857	MORLE, THOMAS B.	Cannington, Bridgwater
1857	MOYSEY, H. G.	Bathealton, Wellington
1857	PITMAN, SAMUEL	Rumwell Lodge, Taunton
1857	POOLE, GABRIEL	Bridgwater
1856	RAYNES, M.	Mells, Frome
1857	SMITH, ROBERT	Exmoor
1857	THOMPSON, WM.	Bath.

Western Division.

Elected.	*Name.*	*Address.*
1857	ACLAND, T. D.	Sprydoncote, Exeter
1856	AMORY, J. H.	Tiverton
1856	BENSON, JOHN	Tavistock
1856	BULLER, J. W.	Downes, Crediton
1857	BELFIELD, JOHN	Park Field, Torquay
1857	CLARKE, R. H.	Bridwell, Collumpton
1856	DAVY, J. T.	Rose Ash, South Molton
1857	FARRANT, M.	Growing, Collumpton
1857	FROUDE, W.	Dartington, Totnes
1856	FRY, JOHN	Woodgate, Wellington
1856	GORDON, C., jun.	Gittisham, Honiton
1857	GOULD, J.	Poltimore, Exeter
1857	HOOPER, JOHN	Chagford
1857	HUSSEY, THOMAS	Waybrooke, Exeter
1857	MAY, R.	Rewe, Exeter
1857	MICHELMORE, T., jun.	Totnes
1857	NEWMAN, T.	Mamhead, Exeter
1857	OLDREIVE, J. L.	Totnes
1857	PORTER, WM.	Hembury Fort, Honiton
1856	TRETHEWY, H.	Grampound, Cornwall
1856	VIDAL, E. U.	Cornborough, Bideford
1856	WIDDICOMBE, J.	Torrhill, Ivybridge
1857	WIPPELL, WM.	Rudway, Thorverton.

PRESIDENT.

LORD COURTENAY, Powderham Castle, Exeter.

(Re-elected for the Year ending June, 1858).

PUBLICATION COMMITTEE.

The LORD PORTMAN.

MILES, WILLIAM, M.P.
ACLAND, THOMAS DYKE
NEWMAN, THOMAS
SMITH, ROBERT, Exmoor.
DYMOND, ROBERT, Exeter.
POOLE, GABRIEL STONE, Bridgwater.

FINANCE COMMITTEE.

ACLAND, T. D., Broadclyst.
HUSSEY, T., Waybrooke.
GILLETT, W. E., Taunton.

CONSULTING CHEMIST.

VOELCKER, Dr. AUGUSTUS, Professor of Chemistry at the Royal Agricultural College, Cirencester.

DIRECTOR OF SHOW-YARD.

WIDDICOMBE, JOHN, Ludbrook Cottage, Ugborough, Devon.

CONSULTING ENGINEERS.

GOOCH, DANIEL, and GOOCH, W. F.

TREASURERS.

BADCOCK, R., Taunton.
DYMOND, R., Exeter.

SECRETARY.

MAULE, HENRY ST. JOHN, Newton St. Loe, near Bath. Offices, 16, Pulteney-street, Bath.

ASSISTANT SECRETARY.

ROBERTS, WILLIAM, Broad Gate, Exeter.

LOCAL CORRESPONDENTS.

Eastern District.

Name.	*Address.*
CLARKE, J.	Selworthy, Dunster
CLARKE, J. A.	Street, Glastonbury
CORNER, R.	Williton
HIGHMORE, J. N.	Yeovil
KINGLAKE, A.	Weston-super-Mare
LUTLEY, JOHN	Wiveliscombe
NICHOLETTS, J. T.	South Petherton
RAYNES, M.	Mells, Frome
RICHARDS, JAMES	Wincanton
SPARKS, W.	Crewkerne
STEPHENS, J.	Taunton.

Western District.

Name.	*Address.*
BAKER, R.	Liskeard
BRAGINTON & Co.	Torrington
EDWARDS, J.	Bampton
LIDSTONE, ROGER	Plymouth
NORTHCOTE, C. C.	Barnstaple
PETHERBRIDGE, R.	Pell, Barnstaple
PITTS, S.	Allington, Kingsbridge
RENDELL, T. L. T.	Tiverton.
WHITLEY, NICHOLAS	Truro
WILLS, JOHN	Launceston
WILLIS, R.	Dinnaton, Barnstaple.

Depôts for Specimens of Manure to be analyzed by Consulting Chemist.

THE SECRETARY	16, Pulteney-st., Bath.	MELHUISH, J.	Taunton.
COTTON, G. K.	Barnstaple.	ROBERTS, W.	Exeter.
FOWLER, HENRY	Chemist, Torrington.	COOPER, C.	Chemist, Exeter.

Newton Meeting.

Stewards of Departments (1857).

Stock.	*Implements.*
Farrant, Mark, Growing, Collumpton.	Gray, John, Somerton.
Fry, John, Woodgate, Wellington.	Knollys, J. E., Taunton.
Moysey, H. G., Bathealton, Wellington.	

Steward of Shedding.—Gray, Jonathan, St. John's Wood, London.

Poultry Department.

Steward.

Pitman, S.	Rumwell Lodge, Taunton.

Secretary :—Kingsbury, John, Taunton.

JUDGES.

STOCK.

Devons.

Cooke, R.	Tiverton.
Miller, T.	Sherbourne.
Wills, John	Launceston.

Short-horns, Herefords, and other Cattle and Horses.

Booth, J.	Cotham, Newark.
Trethewy, Henry	Grampound.
Little, Edward	Chippenham.

Long-woolled Sheep.

Sandy, Wm.	Holme Pierpoint.
Druce, Jos.	Eynsham, Oxford.
Wippell, W.	Thorverton.

Short-woolled Sheep and Pigs.

Gibbs, W.	Kittisford.
Fookes, H.	Whitchurch, Blandford.
Whitaker, J.	Bratton, Westbury.

IMPLEMENTS.

In the Field.

Read, Clare Sewell	Stoke Ferry, Brandon.
Chalcraft, W.	Bramshill House, Liphook.

In the Yard.

Barker, T. H.	Pusey, Farringdon.
Caldwell, H. B.	Hilborowe Hall, Brandon.

Miscellaneous.

Druce, Joseph	Eynsham.
Pitman, Samuel	Taunton.

REPORT OF THE COUNCIL,

Read at the Annual Meeting at NEWTON, *5th June*, 1857.

THE Council reports the steady increase of the Society, which now consists of the following:—

93	Governors,
41	Life Members,
974	Annual Subscribers.
1108	

Being an addition to the Society's ranks of 105 since the last Meeting.

The Society still continues to benefit by the indefatigable exertions of Mr. Jonathan Gray, who has for some time taken up his abode in the neighbourhood of Newton in order to carry out his arrangements for the present Meeting.

A deputation has been appointed to meet at Cardiff for the purpose of inspecting the sites and making arrangements for the South Wales Meeting 1858. The deputation await an official communication from the Committee of that place to proceed with the duties intrusted to them. The Council have engaged the services of Professor Brown, resident Veterinary Surgeon of the Royal Agricultural College, Cirencester, as Veterinary Inspector at the present Meeting.

The Council report that they have offered Prizes for Essays on the following subjects:—1. On Farm Buildings for small Farms, 20*l.* 2. On Personal Experience on a Farm in the West of England, 20*l.* 3. On Irrigation, 10*l.* 4. On Sheep suited to the West of England, 15*l.* 5. On Carts and Waggons, 10*l.* 6. On Orchards, 10*l.* 7. Any other Agricultural subject, 10*l.* 8. Any Chemical subject suited to assist the Agriculturist, 10*l.*

Sir W. Trevelyan has also placed at the disposal of the Council two special Prizes for Essays on the Economical, Physical, Moral, and Social effects of Cider, more especially with reference to its use in the rural districts of Somersetshire and other parts of the West of England, as follows:—For the best and approved Essay, 25*l.*; the second best ditto, 10*l.*

The entries of Stock much exceed those of any former Exhibition. 120 Exhibitors show: Cattle, 131; Sheep, 470; Horses, 41; Pigs, 40; Total Head of Stock 682.

There are 96 Exhibitors of Implements and other articles.

The total number of articles shown is 1100, including eight stands of manure, and occupying a space of 2200 feet of shedding, the sheds being 20 feet in width.

The show of this year presents several features of new interest. The regulations adopted after the Tiverton Meeting, for simplifying the trial of Implements, have been brought into full play, and are found to work admirably; insuring great care and accuracy and a thoroughly practical character in testing the work of the different implements. The excellent arrangements for exhibiting the machinery in action cannot fail to have attracted the attention of visitors. It is with great satisfaction that the Council refer to the invention by a member of their own body of a Dynamometer for testing the power consumed by threshing and other machinery, which has been found, under the supervision of Mr. Gooch, the consulting engineer, assisted by Mr. Easton, to give entire satisfaction to the Exhibitors, Stewards, and Judges.

The Council are gratified in announcing that the Great Western Railway, Bristol and Exeter Railway, and South Devon Railway, have again made their liberal concessions of transit of Stock and Implements, and that the North Devon and London and South-Western have followed their example; but they regret to add that the Eastern Counties have withdrawn the privilege, and in consequence several arrivals entered have been withdrawn, and among others 3 Suffolk Horses.

The Council feel bound to offer their especial acknowledgments to Mr. Dykes of the Bristol and Exeter Railway, Mr. Cockshott of the South Devon Railway, and the other officers of those Railways, for the facilities given them on the present occasion and for the promptitude with which every arrangement has been carried into effect.

The Council have made a further addition to the Show by setting apart a portion of the Yard for the use of those manufacturers who wish to exhibit machinery in motion, but decline to compete for prizes.

The Council report a communication from Robert Bruce, Esq., French and Belgian Consul at Bristol, offering to exhibit Dutch cattle at the Newton Meeting. This addition would have been most desirable; yet on account of the disease prevailing on the Continent the Council were obliged to decline the honour of receiving them into their Yard on the present occasion. They trust that in future years no such impediment may arise to such an extension of the Exhibition.

The Council suggest that Lord Courtenay be re-elected as President for the ensuing year, and that Sir M. Lopes and J. Tyrrell, Esq., be elected Vice-Presidents.

The following gentlemen of Council retire from office by rotation:—

EASTERN DIVISION.—G. H. Andrews, Rimpton, Sherborne; John Bailward, Horsington, Wincanton; Rev. Robert Baker, Compton Martin; George Bullock, Vice-President, North Coker, Yeovil; W. E. Gillett, Taunton; Thomas Gee, Upton-on-Severn; J. D. Hancock, Halse, Taunton; Joseph Lush, Evercreech; Thomas B. Morle, Cannington, Bridgwater; H. G. Moysey, Bathealton, Wiveliscombe; Samuel Pitman, Rumwell Lodge, Taunton; G. S. Poole, Bridgwater.

WESTERN DIVISION.—T. D. Acland, Sprydoncote, Exeter; John Belfield, Park Field, Torquay; M. Farrant, Growing, Collumpton; W. Froude, Dartington, Totnes; J. Gould, Poltimore, Exeter; Thomas Hussey, Waybrooke, Exeter; T. Michelmore, jun., Totnes; T. Newman, Mamhead, Exeter; William Porter, Hembury Fort, Honiton; John Sillifant, Coombe, Copplestone; A. H. D. Troyte, Huntsham, Tiverton; William Wippell, Rudway, Thorverton.

In the eastern division the following gentlemen have consented to be submitted to the Meeting for election in the room of G. Bullock, who has been placed on the list of Vice-Presidents, and

Thomas Gee, retired:—W. Thompson and R. Smith. And the residue of the retiring gentlemen are recommended for re-election.

In the Western Division the following gentlemen have consented to be submitted to the Meeting for election in the room of Sir M. Lopes, M.P., and W. P. Carew, placed on the list of Vice-Presidents:—R. H. Clark and J. L. Oldreive. And the whole of the retiring gentlemen are recommended for re-election.

That the following gentlemen be added to the list of Vice-Presidents:—Sir Massey Lopes, W. P. Carew, and George Bullock.

That the Treasurers be *ex-officio* Members of Council.

Lectures have been delivered at Bath, Exeter, Yeovil, Barnstaple, Plymouth, and Newton, by Professor Voelcker, on various subjects connected with Agricultural Chemistry.

The Council have requested Professor Voelcker to undertake a careful examination of the different kinds of lime and shell-sand used in the West of England, and to write a report upon them founded on careful analyses. The Professor confidently reckons on the assistance of the proprietors of the several lime-kilns for sending in samples, and upon the Members of the Society who use the lime or sand, for furnishing data founded on their own experience as to the effect of these manures upon their land. It is probable also that the Society will derive much benefit from further investigation into the physical geography and climate of this district, undertaken in the most praiseworthy spirit by Mr. Whitley, and deserving of all encouragement from our Society.

The subject of Middle-Class Education, which was brought under the consideration of the Society by Lord Ebrington in October 1855, has again engaged the attention of the Council in consequence of proceedings which originated at Exeter in January in the present year. The plan was laid before the Council in February in the form of a correspondence with the Committee of her Majesty's Privy Council on Education, intimating the fact that two of her Majesty's Inspectors connected with this district had been instructed to give their assistance to the scheme.

The Prizes being offered to boys educated with a view to employments in Agriculture, Arts, Manufactures, and Commerce in the three counties of Cornwall, Devon, and Somerset, and being therefore closely connected with the objects and district of this Society, received the sanction of the Council at a Meeting summoned with special notice in the form of the following Resolutions:—

"That the Council have heard with satisfaction that the Committee of Council on Education have consented to co-operate with a Committee formed at Exeter on the 7th of January last, for the purpose of establishing a system of examination and prizes for boys educated in the West of England, with a view to employments in AGRICULTURE, ARTS, MANUFACTURES, AND COMMERCE.

"That the Council fully assent to the opinion that skill in business generally is best acquired by practice, and that the best preparation for practical life is a good general education.

"That the co-operation of some independent Examiners with a Local Committee appears well calculated to secure confidence in the results of the Examinations.

"That the Council learn with satisfaction that in the present more extended scheme, as well as in that laid before the Council by Lord Ebrington in October, 1855, several Members of this Society are taking an active part, and they beg to place at the disposal of the Committee an Honorary Life Membership of this Society to be competed for as a prize."

The Council cannot but feel gratified by the fact that a plan originating in this district, and promoted by many of its own Members, has been brought under the consideration of the University of Oxford in the form of a Draft Statute submitted by the Council of that learned body to its Convocation; and that similar measures are understood to be in progress at Cambridge.

⁂ The Monthly Meetings of the Council take place on the *last Saturday* in the following months (at the Railway Hotel, Taunton, at 11 40 A.M.):—

JANUARY,
FEBRUARY,
MARCH,
APRIL,
JUNE,
JULY,
AUGUST,
OCTOBER,
NOVEMBER.

The Annual Meeting in the Show-yard at Cardiff at Twelve at Noon on Thursday, 3rd June, 1858.

BATH AND WEST OF ENGLAND SOCIETY.

ANNUAL ACCOUNT.

RECEIPTS.	£.	s.	d.	PAYMENTS.	£.	s.	d.
Balance from last Account, less amount wrongly included from 1857 Account	69	4	3½	Expenses of Yeovil Meeting	107	10	2
Receipts of Yeovil Meeting, &c.	32	10	0	Printing, Stationery, and Advertising	177	12	2
Bath Dividends	28	13	10	Postages	52	7	0
Exeter ditto	17	11	4	Carriage of Parcels	5	0	4
Slack's Annuity	23	6	8	Posting Bills	53	14	5
Governors' Subscriptions	241	0	0	Sundries	27	8	5
Annual Subscriptions	593	1	6	Salaries to Secretary, Assistant-Secretary, and Director	140	0	0
Life Subscriptions	70	0	0	Subscription to Bath Commercial and Literary Institution for custody of Library	1	1	0
Donations	2	0	0	Essays, Prizes for	76	0	0
Journal receipts	17	19	5	Journal, cost of Printing, Distributing, &c.	350	13	10
Chemical receipts	12	7	0	Chemical Lectures, expenses of, &c.	75	18	4
Sundries	3	12	5	Judges' expenses	93	8	4
Subscriptions from Newton	700	0	0	Newton Show-yard, expenses of	1292	9	10½
Show-yard	1305	10	7	Stock and Implement Prizes	503	0	0
Privilege of supplying Refreshments	35	0	0	Medals	24	5	0
Copyright of Catalogue	30	0	0	Certificates of Merit	3	19	0
Entrance Fees	42	15	0	Veterinary Inspector	12	12	0
Fines	25	4	6	Poultry Show, contributions to	176	0	4
Shedding Fees	106	16	0	Plant, cost of Purchase and other expenses, including Rent and Taxes, Wages, &c.	335	2	0
Balance due to the Treasurer	384	11	10	Portable Shedding, cost of, &c.	233	2	2
	£3741	4	4½		£3741	4	4½
1857 Sept. Subscription from Cardiff for Meeting 1858 ..	800	0	0	Balance	384	11	10

CHEMICAL ANALYSES OF MANURES, SOILS, &c.

Terms on which the Society's Consulting Chemist, Dr. A. Voelcker, *may be applied to by* Members only:—

		£.	s.	d.
1.	For advice on one topic	0	7	6
2.	For an opinion as to the genuineness of a sample of Guano	0	7	6
3.	Ditto ditto of Bone-dust	0	5	0
4.	Ditto ditto of Oilcake	0	5	0
5.	For determination of Ammonia in Guano or in other artificial Manures	0	10	6
6.	For partial analysis of Guano	1	1	0
	Such an analysis, except in cases of disputes, is sufficient to determine the commercial value of a sample of Guano.			
7.	For a complete analysis of Guano	1	10	0
8.	For determination of soluble and insoluble Phosphate of Lime in a sample of Superphosphate	1	1	0
9.	For a full analysis of a sample of Superphosphate	2	2	0
10.	For analysis of Nitrate of Soda	0	10	6
11.	Ditto of Sulphate of Ammonia	0	10	6
12.	Ditto of Oilcake	1	1	0
13.	Ditto of Oilcake, including determination of Oil	1	11	6
14.	For a determination of Lime in a Soil	0	15	0
15.	For determination of Lime, Sand, Organic Matter, and Clay in a Soil	1	1	0
16.	For a partial analysis of a Soil	2	2	0
17.	For a full analysis of a Soil	3	3	0
18.	For partial analysis of a Limestone, Marl, or similar Mineral	1	1	0
19.	For complete analysis of Limestone, Marl, &c.	2	2	0
20.	For determination of Carbonate of Lime or Gypsum in Water	1	1	0
21.	For partial analysis of Water	2	2	0
22.	For complete analysis of Water	5	5	0

Samples for examination to be sent free of charge.

Members wishing to exercise their privilege on the above-named terms may, if they please, forward their samples for examination *by parcel, prepaid,* direct to Professor VOELCKER, Royal Agricultural College, Cirencester.

The Professor's *fee must be paid in advance,* by Post-office order or cheque. But as in some cases information may be desired which is not clearly defined in the above list, members will do well to ascertain the expense which they are about to incur by communication with the Professor.

Samples of manures are best sent in tin canisters: ½ lb. to 1 lb. of a previously well-mixed sample taken from the bulk of manure is a sufficient quantity for analysis. If the manure is quite uniform a much smaller quantity is required, and the sample, weighing about 3 or 4 ozs., is best sent by *post*.

The members of the Society are recommended in buying artificial manures to ask for an analytical guarantee. As very inferior manures are often sold on the strength of printed analyses, proving that the import of chemical terms used in copies of analyses is not generally understood, Professor Voelcker has kindly offered to give an opinion gratis on all copies of analyses which members may send to him with a directed and stamped envelope.

Award of Prizes

AT THE MEETING HELD AT THE TOWN OF NEWTON,

On the 3rd, 4th, and 5th of June, 1857.

CATTLE.

DEVONS.

Class 1.

For the best Bull, above three years old on 1st June, 1857 . A Gold Medal.

Second ditto . . . . . . A Silver Medal.

First Prize awarded to Mr. John Bodley, of Stockley Pomeroy, Crediton, in the county of Devon, for his Devon Bull, Napoleon; aged 3 years and 3 months. Bred by himself.

Second Prize awarded to Mr. James Davy, of Flitten Barton, South Molton, in the county of Devon, for his Devon Bull, Napoleon III.; aged 3 years, 2 months. Bred by himself.

Class 2.

For the best Bull, not exceeding three years old on 1st June, 1857 . . . . 12*l.*

Second ditto . . . . 5*l.*

First Prize awarded to Mr. George Turner, of Barton, near Exeter, in the county of Devon, for his Devon Bull, Fereek Khan; aged 2 years and 6 months. Bred by himself.

Second Prize awarded to Mr. James Hole, of Knowle House, Dunster, in the county of Somerset, for his Devon Bull; aged 2 years and 4 months. Bred by himself.

Class 3.

For the best Bull, not exceeding two years old on 1st June, 1857 . . . . 10*l.*

Second ditto . . . . 5*l.*

Third ditto . . . . 3*l.*

First Prize awarded to Mr. Richard Corner, of Torweston, Williton, in the county of Somerset, for his Devon Bull, Britain; aged 1 year 5 months and 2 weeks. Bred by himself.

Second Prize awarded to Mr. Walter Farthing, of Stowey Court, Bridgwater, in the county of Somerset, for his Devon Bull, Alfred the Great; aged 1 year and 5 months. Bred by himself.

Third Prize awarded to Mr. James Davy, of Flitton Barton, South Molton, in the county of Devon, for his Devon Bull, the British King; aged 1 year 9 months and 3 weeks. Bred by himself.

A Prize of 3*l.* awarded to J. W. Buller, Esq., M.P., of the Downes, Crediton, in the county of Devon, for his Devon Bull; aged 11 months and 6 days. Bred by himself.

CLASS 4.

For the best Cow, in Calf (or in Milk, having had a Calf within six months next preceding the first day of the Exhibition) . 8*l.*

Second ditto . . . . 4*l.*

First Prize awarded to Mr. WALTER FARTHING, of Stowey Court, Bridgwater, in the county of Somerset, for his Devon Cow, Fancy; aged 4 years and 4 months. Bred by himself.

Second Prize awarded to Mr. T. W. FOURACRE, of Durston, Taunton, in the county of Somerset, for his Devon Cow, Pretty Maid; aged 6 years and 1 month. Bred by himself.

CLASS 5.

For the best Heifer, in Calf or in Milk, not exceeding three years old on 1st June, 1857 . . . . 8*l.*

Second ditto . . . . 4*l.*

First Prize awarded to Mr. THOMAS WEBBER, of Halberton Court, Tiverton, in the county of Devon, for his Devon Heifer, Nelly; aged 2 years 5 months and 1 week. Bred by himself.

Second Prize awarded to J. W. BULLER, Esq., M.P., of the Downes, Crediton, in the county of Devon, for his Devon Heifer; aged 2 years and 10 months. Bred by himself.

CLASS 6.

For the best Pair of Heifers, not exceeding two years old on 1st June, 1857, belonging to the same owner . . . . 8*l.*

Second ditto . . . . 4*l.*

First Prize awarded to J. W. BULLER, Esq., M.P., of the Downes, Crediton, in the county of Devon, for his Pair of Devon Heifers; No. 1 aged 1 year 6 months and 2 weeks; No. 2 aged 1 year and 2 months. Bred by himself.

Second Prize awarded to Mr. THOMAS STRONG, of Dunchidcock Farm, Exeter, in the county of Devon, for his Pair of Devon Heifers; No. 1 aged 1 year 4 months and 3 days; No. 2 aged 1 year 3 months 2 weeks and 2 days. Bred by himself.

CLASS 7.

SPECIAL PRIZE.

For the best pair of Steers, not exceeding three years old on 1st June, 1857, belonging to the same owner . A Silver Medal.

Second ditto . . . . A Bronze Medal.

No entry.

SHORT-HORNS.

CLASS 8.

For the best Bull, above three years old on 1st June, 1857 A Gold Medal.

Second ditto . . . . A Silver Medal.

First Prize awarded to Mr. WILLIAM JEFFERYS, of Maiden Bradley, Frome, in the county of Somerset, for his Short-horn Bull, Admiral Lyons; aged 3 years 2 months and 3 weeks. Bred by himself.

Second Prize awarded to Mr. WILLIAM HEWER, of Seven Hampton Highworth, in the county of Wilts, for his Short-horn Bull, Barrowby Lad; aged 3 years and 2 months. Bred by Mr. Dickinson, Willisden, Middlesex.

CLASS 9.

For the best Bull, not exceeding three years old on 1st June, 1857 . . . . 12*l*.

Second ditto . . . . 5*l*.

First Prize awarded to Mr. T. B. MILES, of Langford, Bristol, in the county of Somerset, for his Short-horn Bull, Red Rover; aged 2 years 3 months 1 week and 3 days. Bred by Mr. William Hitchman, of Long Ashton, Bristol.

Second Prize awarded to JOHN BULTEEL, Esq., of Flete, Holbeton, in the county of Devon, for his Short-horn Bull, Flete; aged 2 years 2 months and 3 weeks. Bred by the Rev. Charles Barter, of Sarsden, Chipping Norton.

CLASS 10.

For the best Bull, not exceeding two years old on 1st June, 1857, 10*l*.

Second ditto . . . . 5*l*.

First Prize awarded to Mr. RICHARD STRATTON, of Broad Hinton, Swindon, in the county of Wilts, for his Short-horn Bull, Coronet; aged 1 year 1 month and 2 weeks. Bred by himself.

Second Prize awarded to Mr. RICHARD STRATTON, of Broad Hinton, Swindon, in the county of Wilts, for his Short-horn Bull, Victory; aged 1 year 3 months and 1 week. Bred by himself.

CLASS 11.

For the best Cow in Calf (or in Milk, having had a Calf within six months next preceding the first day of the Exhibition) . 8*l*.

Second ditto . . . . 4*l*.

First Prize awarded to Mr. RICHARD STRATTON, of Broad Hinton, Swindon, in the county of Wilts, for his Short-horn Cow, Maria III.; aged 3 years 6 months and 1 week. Bred by himself.

Second Prize awarded to Mr. RICHARD STRATTON, of Broad Hinton, Swindon, in the county of Wilts, for his Short-horn Cow, Matchless III.; aged 3 years and 1 month. Bred by himself.

CLASS 12.

For the best Heifer, in Calf or in Milk, not exceeding three years old on 1st June, 1857 . . . . 8*l*.

Second ditto . . . . 4*l*.

First Prize awarded to Mr. RICHARD STRATTON, of Broad Hinton, Swindon, in the county of Wilts, for his Short-horn Heifer, Matchless IV.; aged 2 years 2 months and 1 week. Bred by himself.

Second Prize awarded to Mr. RICHARD STRATTON, of Broad Hinton, Swindon, in the county of Wilts, for his Short-horn Heifer, Blush Rose; aged 2 years 2 months and 1 week. Bred by himself.

CLASS 13.

For the best Pair of Heifers, not exceeding two years old on 1st June, 1857, belonging to the same owner . . . 8*l*.

Second ditto . . . . 4*l*.

First Prize awarded to Mr. **Richard Stratton**, of Broad Hinton, Swindon in the county of Wilts, for his Pair of Short-horn Heifers; No. 1, Matchless V., aged 1 year and 3 months; No. 2, Coquette II., aged 1 year and 3 months. Bred by himself.

Second Prize awarded to Mr. **William Hewer**, of Sevenhampton, Highworth, in the county of Wilts, for his Pair of Short-horn Heifers; No. 1, Rosetta, aged 1 year 2 months and 3 weeks; No. 2, Matilda, aged 1 year 2 months and 2 weeks. Bred by himself.

Class 14.

Special Prize.

For the best Pair of Steers, not exceeding three years old on 1st June, 1857, belonging to the same owner . A Silver Medal.

Second ditto . . . . A Bronze Medal.

No entry.

HEREFORDS, OR CATTLE OF ANY OTHER PURE BREED.

Class 15.

For the best Bull, above three years old on the 1st of June, 1857 A Gold Medal.

Second ditto . . . . A Silver Medal.

First Prize awarded to Mr. **John E. Hewer**, of Vern House, Mardon, in the county of Hereford, for his Hereford Bull, General; aged 6 years 7 months and 2 weeks. Bred by himself.

Second Prize awarded to Mr. **John Adams**, of Moor Farm, Newhouse, Ivybridge, in the county of Devon, for his South Ham Bull; aged 3 years 6 months 1 week and 1 day. Bred by himself.

Class 16.

For the best Bull, not exceeding three years old on the 1st June, 1857 . . . . 12*l.*

Second ditto . . . . 5*l.*

First Prize awarded to Mr. **J. E. L. Hewer**, Jun., of Vern House, Mardon, in the county of Hereford, for his Hereford Bull, Darling; aged 2 years 10 months and 2 weeks. Bred by himself.

Second Prize awarded to Mr. **W. C. Coles**, of Yewtree Close, Yeovil, in the county of Somerset, for his Hereford Bull, Young Nelson; aged 2 years and 2 weeks. Bred by himself.

Class 17.

For the best Bull, not exceeding two years old on the 1st June, 1857 . . . . 10*l.*

Second ditto . . . . 5*l.*

First Prize awarded to Mr. **John Feaver**, of Westcamel, Ilchester, in the county of Somerset, for his Hereford Bull, General Whiteface; aged 1 year 7 months 2 weeks and 3 days. Bred by Mr. John Williams, of Kingsland, Leominster.

Second Prize awarded to Mr. J. E. L. Hewer, jun., of Vern House, Mardon, in the county of Hereford, for his Hereford Bull, Purifier; aged 1 year and 1 month. Bred by himself.

Class 18.

For the best Cow in Calf (or in Milk, having had a Calf within six months next preceding the first day of the Exhibition	**8*l.***
Second ditto	**4*l.***

First Prize awarded to Mrs. E. Palmer, of Ilchester, in the county of Somerset, for her Hereford Cow, Beauty; aged 9 years 4 months and 3 weeks. Bred by herself.

Second Prize awarded to Mr. T. B. Brown, of Hampen, Andoversford, in the county of Gloucester, for his Hereford Cow, Mottle; aged 6 years and 3 months. Bred by Mr. Perry, of Bullstrode, Herefordshire.

Class 19.

For the best Heifer, in Calf or in Milk, not exceeding three years old on the 1st June, 1857	**8*l.***
Second ditto	**4*l.***

First Prize awarded to Mr. William James, of Mapowder, Blandford, in the county of Dorset, for his Hereford Heifer, Primrose; aged 2 years 1 month and 2 weeks. Bred by himself.

Second Prize awarded to Mr. William James, of Mapowder, Blandford, in the county of Dorset, for his Hereford Heifer, Pretty Maid; aged 2 years 3 months 1 week and 3 days. Bred by himself.

Class 20.

For the best Pair of Heifers, not exceeding two years old on the 1st June, 1857, belonging to the same owner	**8*l.***
Second ditto	**4*l.***

Disqualified—over age.

Class 21.

Special Prize.

For the best Pair of Steers, not exceeding three years old on the 1st June, 1857, belonging to the same owner	**A Silver Medal.**
Second ditto	**A Bronze Medal.**

No entry.

SHEEP.

LEICESTER, or LONG-WOOLLED.

(Not qualified to compete as Cotswold.)

Class 22.

For the best Yearling Ram	**6*l.***
Second ditto	**4*l.***
Third Ditto	**2*l.***

First Prize awarded to Mr. George Turner, of Barton, Exeter, in the county of Devon, for his Leicester Ram; aged 1 year and 3 months. Bred by himself.

Second Prize awarded to Mr. George Turner, of Barton, Exeter, in the county of Devon, for his Leicester Ram; aged 1 year and 3 months. Bred by himself.

Third Prize awarded to Mr. John Bodley, of Stockley Pomeroy, in the county of Devon, for his Leicester Ram; aged 1 year and 1 month. Bred by himself.

Class 23.

For the best Ram of any other age	A Silver Medal.
Second ditto	A Bronze Medal.

First Prize awarded to Mr. John Bodley, of Stockley Pomeroy, in the county of Devon, for his Leicester Ram; aged 3 years and 2 months. Bred by himself.

Second Prize awarded to Mr. George Turner, of Barton, Exeter, in the county of Devon, for his Leicester Ram; aged 3 years and 3 months. Bred by himself.

Class 24.

For the best Pen of Five Ewes	A Silver Medal.

The Prize awarded to J. W. Buller, Esq., M.P., of the Downes, Crediton, in the county of Devon, for his Pen of five Leicester Ewes; three aged 3 years and 3 months, and two aged 2 years and 3 months. Bred by himself.

Class 25.

For the best Pen of Five Two-teeth Ewes	5*l.*
Second ditto	3*l.*
Third ditto	2*l.*

First Prize awarded to Mr. John Salter, of Peverstone, Collumpton, in the county of Devon, for his Pen of Five Leicester Ewes; aged 1 year and 2 months. Bred by himself.

Second Prize awarded to James W. Buller, Esq., M.P., of the Downes, Crediton, in the county of Devon, for his Pen of Five Leicester Ewes; aged 1 year and 3 months. Bred by himself.

Third Prize awarded to Mr. Francis Doble, of Holcombe Barton, Crediton, in the county of Devon, for his Pen of Five Leicester Ewes; aged 1 year and 3 months. Bred by himself.

COTSWOLD.

Class 26.

For the best Yearling Ram	5*l.*
Second ditto	3*l.*

First Prize awarded to Mr. John King Tombs, of Langford, in the county of Gloucester, for his Cotswold Ram; aged 1 year and 2 months. Bred by himself.

Second Prize awarded to Mr. Edward Handy, of Seirford, Cheltenham, in the county of Gloucester, for his Cotswold Ram; aged 1 year 2 months and 2 weeks. Bred by himself.

CLASS 27.

For the best Ram of any other age . . .	A Silver Medal.
Second ditto	A Bronze Medal.

First Prize awarded to Mr. THOMAS B. BROWN, of Hampen, Andoversford, in the county of Gloucester, for his Cotswold Ram; aged 2 years 2 months and 3 weeks. Bred by himself.

Second Prize awarded to Mr. EDMUND RUCK, of Castle Hill, Cricklade, in the county of Wilts, for his Cotswold Ram, Great Western; aged 3 years and 3 months. Bred by himself.

CLASS 28.

For the best Pen of Five Ewes . . .	A Silver Medal.

The Prize awarded to Mr. THOMAS B. BROWN, of Hampen, Andoversford, in the county of Gloucester, for his Pen of Five Cotswold Ewes; aged 3 years and 2 months. Bred by himself.

CLASS 29.

For the best Pen of Five Two-teeth Ewes	5*l.*
Second ditto	3*l.*

First Prize awarded to Mr. JOHN K. TOMBS, of Langford, Lechlade, in the county of Gloucester, for his Pen of Five Cotswold Ewes; aged 1 year and 2 months. Bred by himself.

Second Prize awarded to Mr. THOMAS B. BROWN, of Hampen, Andoversford, in the county of Gloucester, for his Pen of Five Cotswold Ewes; aged 1 year 2 months and 3 weeks. Bred by himself.

COTSWOLD DOWN.

CLASS 30.

For the best Yearling Ram	A Silver Medal.
Second ditto	A Bronze Medal.

No entry.

CLASS 31.

For the best Pen of Five Two-teeth Ewes .	A Silver Medal.
Second ditto	A Bronze Medal.

No entry.

SOUTHDOWNS.

CLASS 32.

For the best Yearling Ram	5*l.*
Second ditto	3*l.*

First Prize awarded to Mr. JOHN MOORE, of Littlecott Farm, Pewsey, in the county of Wilts, for his Southdown Ram; aged 1 year and 3 months. Bred by himself.

Second Prize, ditto, ditto. Bred by himself.

Class 33.

For the best Ram of any other age . .	A Silver Medal.
Second ditto	A Bronze Medal.

No merit.

Class 34.

For the best Pen of Five Ewes . . .	A Silver Medal.

The Prize awarded to Mr. William Lucas, of East Coker, Yeovil, in the county of Somerset, for his Pen of Five Southdown Ewes; aged 3 years and 3 months. Bred by himself.

Class 35.

For the best Pen of Five Two-teeth Ewes	5*l.*
Second ditto	3*l.*

First Prize awarded to Mr. William Lucas, of East Coker, Yeovil, in the county of Somerset, for his Pen of Five Southdown Ewes; aged 1 year and 3 months. Bred by himself.

Second Prize awarded to R. K. M. King, Esq., of Walford, Taunton, in the county of Somerset, for his Pen of Five Southdown Ewes; aged 1 year and 4 months. Bred by himself.

ALL OTHER DOWNS.

(Not qualified to compete as Southdowns.)

Class 36.

For the best Yearling Ram	4*l.*
Second ditto	2*l.*

First Prize awarded to Mr. John Moore, of Littlecott Farm, Pewsey, in the county of Wilts, for his Down Ram; aged 1 year and 3 months. Bred by himself.

Second Prize awarded to George Harbin, Esq., of Newton House, Yeovil, in the county of Somerset, for his Improved Hampshire-down Ram; aged 1 year and 4 months. Bred by himself.

Class 37.

For the best Ram of any other age . .	A Silver Medal.
Second ditto	A Bronze Medal.

First Prize awarded to George Harbin, Esq., of Newton House, Yeovil, in the county of Somerset, for his Improved Hampshire-down Ram; aged 3 years and 4 months. Bred by himself.

Second Prize awarded to George Harbin, Esq., of Newton House, Yeovil, in the county of Somerset, for his Improved Hampshire-down Ram; aged 2 years and 4 months. Bred by himself.

Class 38.

For the best Pen of Five Ewes . . .	A Silver Medal.

The Prize awarded to George Harbin, Esq., of Newton House, Yeovil, in the county of Somerset, for his Pen of Five Improved Hampshire-down Ewes of different ages. Bred by himself.

Class 39.

For the best Pen of Five Two-teeth Ewes . . . . . 4*l.*
Second ditto . . . . 2*l.*

First Prize awarded to Mr. John Moore, of Littlecott Farm, Pewsey, in the county of Wilts, for his Pen of Five Down Ewes; aged 1 year and 3 months. Bred by himself.

Second Prize awarded to George Harbin, Esq., of Newton House, Yeovil, in the county of Somerset, for his Pen of Five Improved Hampshire-down Ewes; aged 1 year and 4 months. Bred by himself.

SOMERSET AND DORSET HORNS.

Class 40.

For the best Yearling Ram . . . . 5*l.*
Second ditto . . . . 3*l.*

First Prize awarded to Mr. Thomas Danger, of Huntstile, Bridgwater, in the county of Somerset, for his Somerset-Horn Ram; aged 1 year 4 months and 2 weeks. Bred by himself.

Second Prize awarded to Mr. Thomas Danger, of Huntstile, Bridgwater, in the county of Somerset, for his Somerset-Horn Ram; aged 1 year 4 months and 3 weeks. Bred by himself.

Class 41.

For the best Ram of any other age . . A Silver Medal.
Second ditto . . . . A Bronze Medal

First Prize awarded to Mr. Robert Templeman, of North Perrot, Crewkerne, in the county of Somerset, for his Dorset-Horn Ram; aged 2 years and 4 months. Bred by himself.

Second Prize.—No competition.

Class 42.

For the best Pen of Five Ewes . . . A Silver Medal.

The Prize awarded to Mr. Robert Templeman, of North Perrot, Crewkerne, in the county of Somerset, for his Pen of Five Dorset-horn Ewes; three aged 3 years and 5 months, and two aged 2 years and 5 months. Bred by himself.

Class 43.

For the best Pen of Five Two-teeth Ewes . . . . 5*l.*
Second ditto . . . . 3*l.*

First Prize awarded to Mr. Thomas Danger, of Huntstile, Bridgwater, in the county of Somerset, for his Pen of Five Somerset-horn Ewes; aged 1 year 4 months and 2 weeks. Bred by himself.

Second Prize awarded to Mr. Robert Templeman, of North Perrot, Crewkerne, in the county of Somerset, for his Pen of Five Dorset-horn Ewes; aged 1 year and 5 months. Bred by himself.

MOUNTAIN SHEEP.

Class 44.

For the best Ram of any age	4*l.*
Second ditto	2*l.*

First Prize awarded to Mr. James Quartley, of Molland House, South Molton, in the county of Devon, for his Mountain Ram; aged 2 years and 3 months. Bred by Mr. John Quartley, Great Champson, Molland, South Molton.

Second Prize awarded to Mr. Petherick Bunt, of Willshead, Exford, in the county of Devon, for his Exmoor Forest-breed Ram; aged 3 years and 2 weeks. Bred by himself.

Class 45.

For the best Pen of Five Ewes, of any age	4*l.*
Second ditto	2*l.*

First Prize awarded to Mr. James Quartley, of Molland House, South Molton, in the county of Devon, for his Pen of Five Mountain Ewes; aged from 4 years and 3 months to 5 years and 3 months. Bred by himself.

Second Prize awarded to Sir Thomas Dyke Acland, Bart., of Killerton, Exeter, in the county of Devon, for his Pen of Five Mountain Ewes; aged from 3 years and 3 months to 5 years and 3 months. Bred by himself at Holnicote, Minehead, Somerset.

HORSES.

FOR AGRICULTURAL PURPOSES.

Class 46.

For the best Mare, in Foal, or with a Foal by her side	10*l.*
Second ditto	5*l.*

First Prize awarded to Rev. J. G. Copplestone, of Offwell Rectory, Honiton, in the county of Devon, for his Herefordshire Mare, Frolic, aged 8 years. Breeder unknown.

Second Prize awarded to Mr. T. B. Miles, of Langford, Bristol, in the county of Somerset, for his Lincolnshire Mare, Blackbird; aged 9 years. Breeder unknown.

Class 47.

For the best Two Years old Colt	10*l.*	20*l.*
Added by Sir Alexander Hood, Bart.	10*l.*	
Second ditto		5*l.*

First Prize awarded to Mr. Henry Hitchcock, of Chilterne, All Saints, Heytesbury, in the county of Wilts, for his Colt, Warwickshire breed, Grey Duke; aged 2 years. Bred by himself.

Second Prize awarded to Mr. Isaac Humphrey, of East Landbrook, South Petherton, in the county of Somerset, for his Cart Colt, Lion; aged 2 years. Bred by himself.

Class 48.

For the best Two Years old Filly	5*l.*
Second ditto	3*l.*

First Prize awarded to Mr. John Anthony, of Yealmpton Mills, Yealmpton, in the county of Devon, for his pure Cart Filly Blossom; aged 2 years and 2 months. Bred by himself.

Second Prize—no competition.

Class 49.

For the best Yearling Colt or Filly	5*l.*
Second ditto	3*l.*

First Prize awarded to Mr. Thomas Scarell, of Bellamarsh, Chudleigh, in the county of Devon, for his Filly, May Flower; aged 1 year and 1 month. Bred by himself.

Second Prize—no competition.

HORSES FOR RIDING PURPOSES.

Class 50.

For the best Mare in Foal, or with a Foal by her side . . .	5*l.*
Second ditto	3*l.*

First Prize awarded to Mr. Richard Watson, of Dorseley, Totnes, in the county of Devon, for his half-bred Hunting Mare; age and Breeder unknown.

Second Prize awarded to Mr. Francis Coaker, of Marldon, Totnes, in the county of Devon, for his Hack Mare, Miss Harkaway; age 9 years. Breeder unknown.

Class 51.

For the best two or three years old Filly	5*l.*
Second ditto	3*l.*

First Prize awarded to Mr. R. H. Watson, of Dorseley, Totnes, in the county of Devon, for his half-bred Filly, Columbine, aged 8 years 2 weeks and 2 days. Bred by Mr. Charles Mason, of Bernleigh, Totnes.

Second Prize awarded to Rev. H. M. Northcote, of Hatherleigh, in the county of Devon, for his Filly, Bertha; aged 2 years and 2 months. Bred by himself.

Class 52.

For the best yearling Colt or Filly	5*l.*
Second ditto	3*l.*

First Prize awarded to Mr. William Gapper, of Duddlestone, Taunton, in the county of Somerset, for his half-bred Colt, Nemo; aged 1 year 1 month 2 weeks and 5 days. Bred by himself.

Second Prize awarded to Rev. H. M. Northcote, of Hatherleigh, in the county of Devon, for his Colt, Baronet; aged 1 year and 2 months. Bred by himself.

Class 53.

For the best two or three years old Colt or Gelding	A Silver Medal.
Second ditto	A Bronze Medal.

First Prize awarded to Mr. R. H. Watson, of Dorseley, Totnes, in the county of Devon. Also highly commended for his half-bred Colt, Cardinal; aged 2 years 11 months 3 weeks and 5 days. Bred by himself.

Second Prize awarded to Mr. Edward Elliott, of Hollowcombe, Ermebridge, in the county of Devon, for his Hack Colt, Joseph Andrews; aged 2 years 11 months and 3 weeks. Bred by himself.

PONIES.

Class 54.

For the best Mare Pony of any breed, not exceeding 13 hands high . . . . 4l.

Second ditto . . . . 2l.

First Prize awarded to Mr. William Nosworthy, of Ford, Manaton, Moreton Hampstead, in the county of Devon, for his Exmoor Pony, Nelly; aged 12 years. Breeder unknown.

Second Prize awarded to Mr. William Furneaux, of South Brent, in the county of Devon, for his Exmoor Pony; aged 9 years. Breeder unknown.

PIGS.

LARGE BREED

Class 55.

For the best Boar, not exceeding two years old on the 1st January, 1857 . . . . 4l.

Second ditto . . . . 2l.

First Prize awarded to Mr. John K. Tombs, of Langford, Lechlade, in the county of Gloucester, for his Berkshire Boar; aged 1 year and 1 month. Bred by himself.

Second Prize awarded to Mr. William Hewer, of Seven Hampton, Highworth, in the county of Wilts, for his Berkshire Boar, aged 5 months and 3 weeks. Bred by himself.

Class 56.

For the best Breeding Sow in farrow, or that has farrowed within four months of the first day of the Exhibition . . . . 4l.

Second ditto . . . . 2l.

First Prize awarded to Mr. William Hewer, of Seven Hampton, Highworth, in the county of Wilts, for his Berkshire Sow, Duchess of Gloucester; aged 5 years and 3 months. Bred by himself.

Second Prize awarded to R. N. Grenville, Esq., of Butleigh, Glastonbury, in the county of Somerset, for his Improved Berks Sow; aged 2 years. Bred by himself.

Class 57.

For the best Pen of Three Breeding Sows, not exceeding nine months of age on the 1st June, 1857 . . . . . 3l.

Second ditto . . . . 2l.

First Prize awarded to Mr. WILLIAM HEWER, of Seven Hampton, Highworth, in the county of Wilts, for his Pen of Three Berkshire-breed Sows; aged 5 months 3 weeks. Bred by himself.

Second Prize awarded to R. N. GRENVILLE, Esq., of Butleigh, Glastonbury, in the county of Somerset, for his Pen of Three Improved Berkshire-breed Sows; aged 13 weeks. Bred by himself.

SMALL BREED.

CLASS 58.

For the best Boar, not exceeding two years old on the 1st January, 1857 . . . . 4*l*.

Second ditto . . . . 2*l*.

First Prize awarded to Mr. GEORGE TURNER, of Barton, Exeter, in the county of Devon, for his Improved Essex Boar; aged 8 months and 1 week. Bred by himself.

Second Prize awarded to Mr. W. L. BREYLEY, of Corfe Farm, Barnstaple, in the county of Devon, for his Small-breed Boar, Emperor; aged 1 year 11 months 2 weeks and 5 days. Bred by himself.

CLASS 59.

For the best Breeding Sow in farrow, or that has farrowed within four months of the first day of the Exhibition . . . . 4*l*.

Second ditto . . . . 2*l*.

First Prize awarded to the Rev. G. F. HODSON, of North Petherton, in the county of Somerset, for his Improved Leicester Sow, Stella; aged 1 year and 1 month. Bred by himself.

Second Prize awarded to Mr. GEORGE TURNER, of Barton, Exeter, in the county of Devon, for his Improved Essex Sow; aged 1 year and 7 months. Bred by himself.

CLASS 60.

For the best Pen of Three Breeding Sows, not exceeding nine months of age on the 1st day of June, 1857 . . . . . 3*l*.

Second ditto . . . . 2*l*.

First Prize awarded to Mr. GEORGE TURNER, of Barton, Exeter, in the county of Devon, for his Three Improved Essex-breed Sows; aged 7 months and 2 weeks. Bred by himself.

Second Prize awarded to Mrs. E. PALMER, of Ilchester, in the county of Somerset, for her Three Essex-breed Sows; aged 6 months. Bred by herself.

EXTRA STOCK AWARDS.

No.

A Prize of 2*l.* awarded to—

393. Mr. William Rendell, Kingston, Staverton, Totnes, in the county of Devon, for his South Devon Heifer; aged 4 years and 3 months. Bred by himself.

401. Mr. William Jackson, of Bullaton, Hennock, in the county of Devon, for his entire Pack Horse, Mazeppa; aged 8 years and 1 month. Bred by himself.

350. Bounty of 2*l.* to Mr. Henry Bailey, Walgaston Farm, Berkeley, in the county of Gloucester, for his Leicestershire Colt, Young Kohinoor; aged 1 year. Bred by Mr. Bennett, North Nibley, Gloucester.

COMMENDATIONS.

Class.

1. Generally commended.

*2. Mrs. Elizabeth Anstey, of Venn Farm, Tiverton, in the county of Devon, for her Devon Bull, Earl of Devon; aged 2 years and 11 months. Bred by the late Mr. Davy, of Tiverton, Devon.

4. Mr. Thomas Webber, of Halberton Court, Tiverton, in the county of Devon, for his Devon Cow, Lily; aged 6 years and 2 months. Bred by himself.

" J. W. Buller, Esq., M.P., of the Downes, Crediton, in the county of Devon, for his Devon Cow; aged 5 years and 7 months. Bred by himself.

5. Generally commended.

*9. Mr. William Fowle, of Market Lavington, in the county of Wilts, for his Short-horn Bull, The Warminster Lad; aged 2 years and 11 months. Bred by himself.

10. Mr. Samuel Widdicombe, of Hay, Ugborough, in the county of Devon, for his Short-horn Bull, Constantine II.; aged 10 months 3 weeks and 1 day. Bred by Mr. William Widdicombe, Ludbrook, Ugborough, Ivybridge.

*11. Lady Pigot, of Chippenham Park, Soham, Cambridge, for her Short-horn Cow, Happiness; aged 3 years 2 months and 2 weeks. Bred by Mr. Jonas Webb, of Babraham, Cambridge.

17. Mr. George Dudee, of Kingskeiswell, Newton Abbot, in the county of Devon, for his South Devon Bull; aged 1 year 11 months 3 weeks and 4 days. Bred by Mr. George Candish, of Ilsington, Ashburton.

18. Mr. John Rendell, of Coffinswell, Newton Abbott, in the county of Devon, for his two South Devon Cows, Flower and Gentle.

*18. Mr. Walter Rendle, of Coombinhead, Teignmouth, in the county of Devon, for his two South Devon Cows, Cherry and Dairymaid. Bred by himself.

Class.

22. Mr. **George Radmore**, of Court Hayes, Thorverton, in the county of Devon, for his Leicester Ram; aged 1 year and 3 months. Bred by himself.

„ J. W. **Buller**, Esq., M.P., of the Downes, Crediton, in the county of Devon, for his Leicester Ram; aged 1 year and 3 months. Bred by himself.

„ Mr. **John Bodley**, of Stockley Pomeroy, Crediton, in the county of Devon, for his Leicester Ram; aged 1 year and 1 month. Bred by himself.

23. Mr. J. B. **Corner**, of Longforth, Wellington, in the county of Somerset, for his Long-woolled Ram; aged 2 years and 4 months. Bred by himself.

„ Mr. **Thomas Potter**, of Yellowford Farm, Thorverton, in the county of Devon, for his Leicester Ram; aged 3 years and 2 months. Bred by himself.

„ Mr. **John Partridge**, of Bow, Crediton, in the county of Devon, for his New Leicester Ram; aged about 2 years and 3 months. Bred by himself.

„ Mr. **John Bodley**, of Stockley Pomeroy, Crediton, in the county of Devon, for his Leicester Ram, aged 3 years and 2 months. Bred by himself.

*24. Mr. **John Partridge**, of Bow, Crediton, in the county of Devon, for his Pen of Five New Leicester Ewes; ages varying from 3 to 6 years. Bred by himself.

27. Mr. T. B. **Brown**, of Hampen, Andoversford, in the county of Gloucester, for his Cotswold Ram; aged 2 years 2 months 2 weeks. Bred by himself.

*34. R. K. M. **King**, Esq., of Walford, Taunton, in the county of Somerset, for his Pen of Five Southdown Ewes; aged 3 years and 6 months.

39. Generally commended.

45. Sir T. D. **Acland**, Bart., of Killerton, Exeter, in the county of Devon, for his Pen of Five Mountain Ewes; aged from 3 years and 3 months to 5 years and 3 months. Bred by himself.

50. Highly commended.

52. Rev. J. G. **Copplestone**, of Offwell Rectory, Honiton, in the county of Devon, for his Mixed Arabian and English Colt, Mohammed; aged 1 year. Bred by himself.

53. Mr. **William Gapper**, of Duddlestone, Taunton, in the county of Devon, for his half-bred Colt, Young Bowstring; aged 2 years 1 month 1 week and 4 days. Bred by himself.

55. Mr. **William Hewer**, of Sevenhampton, Highworth, in the county of Wilts, for his Berkshire Boar; aged 5 months and 3 weeks. Bred by himself.

56. Commended.

*58. Mr. **Henry Parsons**, of Haselbury, in the county of Somerset, for his Ducie-breed Boar; aged 1 year and 10 months. Bred by the Right Hon. Lord Portman.

59. Mr. **William L. Brailey**, of Corfe Farm, Barnstaple, in the county of Devon, for his Small-breed Sow, Gipsy Queen; aged 1 year 11 months 2 weeks and 5 days.

Class.

*59 Mr. GEORGE TURNER, of Barton, Exeter, in the county of Devon, for his Improved Essex Sow; aged 1 year and 7 months. Bred by himself.

* ,, Mr. T. R. CORNISH, of Hayes Farm, Ideford, in the county of Devon, for his Improved Leicester-breed Sow, Gipsy Queen; aged 11 months. Bred by Mr. James Cornish, of Ideford, Chudleigh.

EXTRA STOCK.

No.

400. G. S. POOLE, Esq., Bridgwater, in the county of Somerset, for his Grey Gelding; aged 3 years 1 month and 2 weeks. Bred by Mr. Simon Hooper, deceased.

*405. Mr. WILLIAM FURNEAUX, of South Brent, in the county of Devon, for his Exmoor Pony.

392. Mr. JOHN RENDELL, of Coffinswell, Newton Abbott, in the county of Devon, for his South Devon Cow; aged 6 years and 9 months. Bred by himself.

395. JOHN TYRRELL, Esq., of New Court, Topsham, in the county of Devon, for his Guernsey Cow and Calf, the Queen's Sister; aged 8 years and 10 months. Breeder unknown.

396. Mr. GEORGE THORNE, of West Buckland, South Molton, in the county of Devon, for his North Devon Heifer Calf, Martha; aged 10 months 1 week and 6 days. Bred by himself.

398. G. S. POOLE, Esq., of Bridgwater, in the county of Somerset, for his Cart Mare and Foal, Diamond; aged 9 years. Breeder unknown.

⁂ Those marked * were *highly* commended.

For Awards of Prizes to ESSAYS, *see Report.*

Award of Prizes

FOR IMPLEMENTS.

Section 1.

PREPARATION OF GROUND.

Class.		Prizes
1.	For the best Plough for general purposes . . . . . The Prize awarded to Messrs. J. and R. Wright, Sandford, in the county of Devon, and Mr. John Eddy of Kenford, Exeter, in the county of Devon, equally.	*3l.*
2.	For the best Subsoil Plough . . . . The Prize awarded to Mr. E. H. Bentall, of Heybridge, Maldon, in the county of Essex.	3*l.*
3.	For the best Turnwrest Plough, which will efficiently turn the Furrow against the hill . . . . . . The Prize awarded to Mr. John Eddy, of Kenford, Exeter, in the county of Devon.	3*l.*
4.	For the best Cultivator, Grubber, and Scarifier (wide) . The Prize awarded to Mr. E. H. Bentall, of Heybridge, Maldon, in the county of Essex, and Richard Coleman, of Chelmsford, in the county of Essex, equally.	3*l.*
5.	For the best ditto (narrow) . . . . The Prize awarded to Mr. Richard Coleman, of Chelmsford, in the county of Essex.	2*l.*
6.	For the best pair of Drags . . . . The Prize awarded to Mr. John Eddy, of Kenford, Exeter, in the county of Devon.	1*l.*
7.	For the best set of Harrows . . . . The Prize awarded to Mr. John Eddy, of Kenford, Exeter, Devon, and Messrs. A. and T. Fry, of Bristol.	1*l.*
8.	For the best set of Seed Harrows . . . . . . The Prize awarded to Mr. James Comins, of South Molton, in the county of Devon.	1*l.*
9.	For the best Clod-Crusher or Pulverizer . . . . . The Prize awarded to Mr. John Eddy, of Kenford, Exeter, in the county of Devon.	2*l.*

SECTION 2.

CULTIVATION OF CROPS.

Class.		First Prizes.	Second Prizes.
10.	For the best Corn Drill . . . . . . First Prize awarded to Messrs. HOLMES and SONS, of Norwich, in the county of Norfolk. Second Prize awarded to Mr. J. L. BOWHAY, of Modbury, in the county of Devon.	*5l.*	*2l.*
11.	For the best Corn Drill, for small occupations in hilly districts . . . . First Prize awarded to Messrs. HOLMES and SONS, of Norwich, in the county of Norfolk. Second Prize withheld.	*5l.*	*2l.*
12.	For the best Turnip and Mangold-wurzel Drill for ridge or flat, depositing Manure with the Seed . First Prize awarded to Messrs. R. and J. REEVES, of Bratton Works, Westbury, in the county of Wilts. Second Prize awarded to Messrs. HOLMES and SONS, Norwich, in the county of Norfolk.	*5l.*	*2l.*
13.	For the best General Drill, capable of Distributing at pleasure Liquid Manure with the Seed . . The Prize awarded to Messrs. R. and J. REEVES, of Bratton Works, Westbury, in the county of Wilts.	*5l.*	
14.	For the best General Manure Distributor . . First Prize awarded to Messrs. HOLMES and SONS, of Norwich, in the county of Norfolk. Second Prize awarded to Messrs. R. and J. REEVES, of Bratton Works, Westbury, in the county of Wilts.	*5l.*	*2l.*
15.	For the best Horse Hoe for green crops on the ridge and flat . . . . The Prize awarded to Mr. H. CARSON, of Warminster, in the county of Wilts.	*1l.*	
16.	For the best ditto on steep hill-sides, specially adapted to work horizontally along the side of the hill . . Prize withheld.	*2l.*	
17.	For the best Machine for setting out Turnips on the ridge or flat preparatory to singling . . . The Prize awarded to Mr. JOHN EATON, of Thrapstone.	*3l.*	

Class. First Prizes. Second Prizes.

18. For the best Hand Machine for filling up vacancies in drilled Green Crops . . . . 1*l.*

The Prize awarded to Mr. W. C. CAMBRIDGE, of Bristol.

SECTION 3.

HARVESTING CROPS, AND PREPARING FOR MARKET.

19. For the best Reaping Machine . . . . . 5*l.* 2*l.*

First Prize awarded to Mr. J. L. BOWHAY, of Modbury, in the county of Devon.

Second Prize, not awarded.

20. For the most efficient Horse Rake for collecting Hay or Corn, having a mode of delivery more or less self-acting . . . . 2*l.*

The Prize awarded to Mr. B. J. WEBBER, of Newton Abbott, in the county of Devon.

21. For the most economical and practically useful Portable Steam Engine, not exceeding Eight Horse Power . . . . 10*l.* 5*l.*

First Prize not awarded.

Second Prize awarded to Mr. OLIVER MAGGS, Wincanton, in the county of Somerset.

22. For the Portable Combined Steam Threshing Machine, which shall most perfectly prepare the Sample for Market . . . . . . 10*l.*

The Prize awarded to Messrs. HUMPHRIES, of Pershore, in the county of Worcester.

23. For the simplest and most practically useful Portable Combined Steam Threshing Machine, not requiring more than Six-Horse Power . . . . . 5*l.*

The Prize awarded to Messrs. HUMPHRIES, of Pershore, in the county of Worcester.

24. For the simplest and most practically useful Portable Threshing Machine, with Riddle and Straw-Shaker, not requiring more than 3½ Horse-power, when worked independently of its horse-gear . . . 5*l.*

The Prize awarded to Messrs. BRINSMEAD, of Great Torrington, in the county of Devon.

Class. First Prizes. Second Prizes.

25. For the best Portable Four-horse Gear, adapted for driving Threshing Machines . . . . . 3*l.*

The Prize awarded to Mr. B. J. Webber, of Newton Abbott, in the county of Devon.

26. For the best Machine for stamping Seed out of Flax . 2*l.*

Prize not awarded.

27. For the best Machine for Scutching Flax . . 2*l.*

Prize not awarded.

28. For the best adaptation of the Threshing Machine for Shelling of Clover . . . . 2*l.*

Prize not awarded.

29. For the best Winnowing Machine, which shall be also convertible into a simple blower . . . 3*l.*

The Prize awarded to Mr. J. Eaton, of Thrapstone, in the county of Northampton.

30. For the best One-Horse Cart for general purposes . 2*l.*

The Prize awarded to Messrs. Milford and Son, of Thorverton, in the county of Devon.

31. For the best Two-Horse Waggon . . . . . 2*l.*

The Prize awarded to Messrs. Milford and Son, of Thorverton, in the county of Devon.

32. For the best Rick Cover, fixed or portable . . 2*l.*

The Prize not awarded.

Section 4.

PREPARATION OF FOOD FOR STOCK.

Prizes.

33. For the best Chaff Cutter, worked by Horse or Steam Power . . . . 3*l.*

The Prize awarded to Mr. James Cornes, of Barbridge, Nantwich, in the county of Cheshire.

34. For the best Chaff Cutter, worked by Hand . . . 2*l.*

The Prize awarded to Mr. James Cornes, of Barbridge, Nantwich, in the county of Cheshire.

35. For the best Machine for Grating or Pulping Roots . . 2*l.*

The Prize awarded to Mr. E. N. Bentall, of Heybridge, Maldon.

Class. Prizes.

36. For the best Turnip Cutter . . . . 1*l.*

The Prize awarded to Mr. H. CARSON, of Warminster, in the county of Wilts.

37. For the best Corn and Pulse Bruiser, worked by Horse or Steam Power . . . . 2*l.*

The Prize awarded to Messrs. TURNER, of Ipswich, in the county of Suffolk.

38. For the best Corn and Pulse Crusher, worked by Hand . 1*l.*

The Prize awarded to Mr. WOOD, of Stowmarket.

39. For the best Oil-Cake Crusher, for every description of Cake 1*l.*

The Prize awarded to Messrs. SMITH and ASHBY, of Stamford, in the county of Lincoln.

40. For the best Gorse Bruiser . . . . 2*l.*

No award.

41. For the best and most economical Steaming Apparatus, for Preparing Food for Cattle, Pigs, &c. . . . . . 2*l.*

The Prize awarded to Messrs. RICHMOND and CHANDLER, of Salford, Manchester, and Liverpool.

SECTION 5.

MISCELLANEOUS.

42. For the best Churn . . . . 1*l.*

The Prize awarded to the Rev. E. A. FERRYMAN, Wadenhoe, Oundle Rectory, Northampton, exhibited by Mr. W. L. FISHER, of Thrapstone.

43. For the best Cheese Press . . . . 1*l.*

The Prize awarded to Mr. H. CARSON, of Warminster, in the county of Wilts.

44. For the best Apple Mill calculated to crush the pips also . 2*l.*

The Prize awarded to Messrs. WIGHTMAN and DENING, of Chard, in the county of Somerset.

45. For the best Cider Press . . . . 2*l.*

The Prize not awarded.

46. For the best Cooking Apparatus for Farm Kitchens . . 2*l.*

The Prize awarded to Mr. JOHN GLIDDON, of Williton, in the county of Somerset.

47. For the best Field Gate, not less than 9 feet in length, fitted with Hangings and Fastenings . . . . . . 1*l.*

The Prize not awarded.

Class. Prizes.

48. For the best specimen of Substantial Fencing, calculated to resist Cattle of all kinds, constructed either of Iron, Wood, or a combination of both materials . . . . 2*l.*

The Prize awarded to Messrs. **Hill** and **Smith**, of Brierly Hill, Dudley, Stafford.

SPECIAL AWARDS.

Awarded to Mr. W. **Sawney**, of Beverley, in the county of York, for a Registered Weighing Machine and Sack Lifter combined, 1*l.*

Awarded to Messrs. **Whitmee** and Co., of London, for a Flour Mill, 10*s.*

Awarded to Messrs. E. R. and F. **Turner**, of Ipswich, in the county of Suffolk, for a combined Crushing and Grinding Mill, 3*l.*

Awarded to Mr. R. **Collins**, of Trent, Sherborne, for a Patent Scarifier for Light Lands, to be worked with one, two, or three Horses, 1*l.*

Awarded to Mr. **Samuel Rowsell**, of Buckland St. Mary, Chard, in the county of Somerset, for a Hay Collector, 10*s.*

CERTIFICATES OF MERIT.

Awarded to Mr. **Isaac James**, of Cheltenham, for a Liquid Manure Cart.

Awarded to Messrs. **Moore** and Co., London, for a Circular Saw.

Awarded to Mr. R. **Coleman**, of Chelmsford, in the county of Essex, for a Patent Potato Digger.

Awarded to Mr. W. **Cambridge**, of Bristol, for a Patent Self-relieving Chain Harrow.

Awarded to Mr. **John Heard**, of Sandford, for an Irrigation Gutter Plough.

Awarded to Messrs. **Dray** and Co., of London, for a Wrought-iron Steeled Bar for Plough-Share Point.

Awarded to Mr. **Samuel Lock**, of Kingskerswill, in the county of Devon, for a One-horse Cart, and particularly for excellency of workmanship, and attention to details.

Awarded to Mr. **William Busby**, of Newton-le-Willows, Bedale, in the county of York, for a One-horse Cart.

Awarded to Mr. E. **Taylor**, jun., of East Coker, in the county of Somerset, for a Rick Cover.

Awarded to Messrs. **Brown** and **Son**, of Lyme Regis, in the county of Dorset, for an Improved Cooking Apparatus.

Awarded to Mr. **Thomas Bigg**, of London, for a New and Improved Sheep-Dipping Apparatus on wheels.

Awarded to Messrs. **James** and **Malcolm**, of London, for a Cattle-weighing Machine.

Awarded to Mr. **John C. Stark**, of Torquay, for various articles of general usefulness.

warded to Mr. SAMUEL PEARSE, of Exeter, for a Patent Endless Band Saw.

warded to Mr. JOHN WESTCOTT, of Thorverton, for Double Cottage Bee-Hives.

warded to Mr. R. BOBY, of Bury St. Edmonds, in the county of Suffolk, for a Patent Corn Screen.

warded to Mr. JOHN EDDY, for a Cider Press.

warded to Messrs. THOMAS and HAYWARD, of Wellington, for Hollow Bricks for Culverts.

warded to Messrs. SMITH and ENGLAND, for Patent Spades and Shovels.

COMMENDATIONS OF IMPLEMENTS.

r. H. CARSON, of Warminster, in the county of Wilts, for a Wrought-iron Plough, for General Purposes.

r. GEORGE HOLE, of Kenton, in the county of Wilts, for a Plough for General Purposes.

Mr. JAMES PITTS, of Stokenteignhead, for a Subsoil Plough.

essrs. HART, GIBBINS, and Co., of Wantage, in the county of Berks, for a Berkshire Cultivator with Seven Shares.

Mr. E. H. BENTALL, of Heybridge, Maldon, in the county of Essex, for a Patent Broadshare as Harrow Cultivator.

r. CHARLES JEWELL, of Dawlish, for a pair of Iron Drags.

Mr. JOHN EDDY, of Kenford, Exeter, in the county of Devon, for a set of Seed Harrows.

r. E. H. BENTALL, of Heybridge, Maldon, in the county of Essex, for a Patent Three-Beamed Harrow.

r. H. CARSON, of Warminster, in the county of Wilts, for a Registered Self-Cleaning Cross-Cut Wheel Roller, and Clod Crusher.

Messrs. A. and T. FRY, for Patterson's Patent Clod Crusher.

essrs. R. J. WRIGHT, of Landford, Crediton, for a Horse Hoe, for the Ridge and Flat.

Mr. W. L. FISHER, of Thrapstone, in the county of Northampton, for an Oil Cake Crusher.

r. H. CARSON, of Warminster, in the county of Wilts, for a Chaff Cutter for Hand Power.

r. R. BOBY, of Bury St. Edmonds, in the county of Suffolk, for a Winnowing Machine.

r. GEORGE MILFORD, of Thorverton, Collumpton, in the county of Devon, for a Two-horse Waggon.

Messrs. WIGHTMAN and DENNING, of Chard, in the county of Somerset, for a Cheese Press.

r. JOHN C. STARK, of Torquay, in the county of Devon, for a Cooking Apparatus.

r. W. C. CAMBRIDGE, of Bristol, in the county of Somerset, for a Portable Steam Engine.

*Messrs. Hart, Gibbons, and Co., of Wantage, in the county of Berks, for a Combined Steam Threshing Machine.

Mr. W. C. Cambridge, of Bristol, in the county of Somerset, for a Combined Steam Threshing Machine.

*Mr. J. Polyblank, of Newton, for a Combined Threshing Machine.

Mr. Henry Beare, of Islington, Newton, for a Combined Threshing Machine and Horse Gear.

*Messrs. Smith and Ashby, of Stamford, in the county of Lincoln, for a Chaff Cutter for Steam Power.

*Mr. Hugh Carson, of Warminster, in the county of Wilts, for a Chaff Cutter for Steam Power.

Messrs. Burrow and Page, of Morchard Bishop, for a Winnowing Machine.

Messrs Brown and Son, of Lyme Regis, for a Portable Cattle Food Steaming Apparatus.

Messrs. Wightman and Denning, of Chard, in the county of Somerset, for an Iron Field Gate.

Messrs. Hill and Smith, of Dudley, in the county of Worcester, for an Iron Field Gate.

⁂ Those marked * were *highly* commended.

Award of Prizes
FOR POULTRY.

POULTRY.

JUDGES.

T. G. Legetmier and W. Chaloner, Esqrs.

SPANISH.

Class 1.

For the best Cock and Two Hens of any age	**Handsome Silver Cup**
Second Prize	**1*l*. 0*s*. 0*d*.**

Sixteen Entries.

First Prize awarded to Mr. J. K. **Bartrum**, Bath.

Second Prize awarded to Mr. G. **Botham**, Wexham Court, Slough, Bucks.

DORKING (Coloured).

Class 2.

For the best Cock and Two Hens of any age	Handsome Silver Cup.
Second Prize	**1*l*. 0*s*. 0*d*.**

Eleven Entries.

First Prize awarded to Mr. C. H. **Wakefield**, Malvern Wells, Worcestershire.

Second Prize awarded to Mr. G. S. **Fox**, The Court, Wellington.

DORKING (White).

Class 3.

For the best Cock and Two Hens of any age	Handsome Silver Cup.
Second Prize	**1*l*. 0*s*. 0*d*.**

Seven Entries.

First Prize awarded to Mr. F. J. **Coleridge**, the Manor House, Ottery St. Mary, Devon.

Second Prize awarded to Mr. H. **Lingwood**, Needham Market, Suffolk.

COCHIN CHINA (Cinnamon, Buff, or Lemon).

Class 4.

For the best Cock and Two Hens of any age	Handsome Silver Cup.
Second Prize	**1*l*. 0*s*. 0*d*.**

Fifteen Entries.

First Prize awarded to the Rev. T. H. **Roper**, Eton, Windsor.

Second Prize awarded to Mrs. **Henry Fookes**, Whitchurch, Blandford, Dorset.

COCHIN CHINA (Brown, Partridge, and Grouse).

Class 5.

For the best Cock and Two Hens of any age . Handsome Silver Cup.
Second Prize . . . . 1*l*. 0*s*. 0*d*.

Eleven Entries.

First Prize awarded to the Rev. G. F. Hodson, North Petherton, Somerset.
Second Prize awarded to the Rev. G. F. Hodson.

COCHIN CHINA (White and Black).

Class 6.

For the best Cock and Two Hens of any age . Handsome Silver Cup.
Second Prize . . . . 1*l*. 0*s*. 0*d*.

Ten Entries.

First Prize awarded to Mr. Robert Chase, Moseley Road, Birmingham.
Second Prize awarded to Mr. Peters, The Priory, Fratton, Plymouth.

BRAMAH POUTRA.

Class 7.

For the best Cock and Two Hens of any age . Handsome Silver Cup.
Second Prize . . . . 1*l*. 0*s*. 0*d*.

Six Entries.

First Prize awarded to Mr. Hopkins, Higford, near Shiffnal, Salop.
Second Prize awarded to Miss Brendford, Puddreven, near Torquay, Devon.

GAME (White and Piles).

Class 8.

For the best Cock and Two Hens of any age . Handsome Silver Cup.
Second Prize . . . . 1*l*. 0*s*. 0*d*.

Seven Entries.

First Prize awarded to Mr. Samuel Matthew, Stowmarket, Suffolk.
Second Prize awarded to Mr. Camm, Farnsfield, Southwell, Notts.

GAME (Black Breasted and other Reds).

Class 9.

For the best Cock and Two Hens of any age . Handsome Silver Cup.
Second Prize . . . . 1*l*. 0*s*. 0*d*.

Twenty-three Entries.

First Prize awarded to Mr. Matthew, Stowmarket, Suffolk.
Second Prize awarded to Mr. N. M. de Rothschild, Gunnersbury Park.

GAME (Duckwings and other Greys and Blues)

Class 10.

For the best Cock and Two Hens of any age	Handsome Silver Cup.
Second Prize	1*l.* 0*s.* 0*d.*

Seventeen Entries.

First Prize awarded to Mr. Matthew, Stowmarket, Suffolk.
Second Prize awarded to Mr. Dawson, Selly Oak, Birmingham.

GAME (Blacks and Brassey-winged, except Greys).

Class 11.

For the best Cock and Two Hens of any age	Handsome Silver Cup.
Second Prize	1*l.* 0*s.* 0*d.*

Six Entries.

First Prize awarded to Mr. Dawson, Selly Oak, Birmingham.
Second Prize awarded to Mr. Parry, Wellington, Salop.

MALAY.

Class 12.

For the best Cock and Two Hens of any age	Handsome Silver Cup.
Second Prize	1*l.* 0*s.* 0*d.*

Ten Entries.

First Prize awarded to Mr. Rogers, Woodbridge, Suffolk.
Second Prize awarded to Mr. Adney, Lympstone, Devon.

HAMBURGH (Golden-Pencilled).

Class 13.

For the best Cock and Two Hens of any age	Handsome Silver Cup.
Second Prize	1*l.* 0*s.* 0*d.*

Fourteen Entries.

First Prize awarded to Mr. Martin, Northwick Terrace, Claines, Worcestershire.
Second Prize awarded to Mr. G. C. Adkins, West House, Edgbaston, Birmingham.

HAMBURGH (Silver-Pencilled).

Class 14.

For the best Cock and Two Hens of any age	Handsome Silver Cup.
Second Prize	1*l.* 0*s.* 0*d.*

Nine Entries.

First Prize awarded to Mr. Archer.
Second Prize awarded to the Rev. T. L. Fellowes, Beighton Rectory, Acle, Norfolk.

HAMBURGH (GOLDEN-SPANGLED).

CLASS 15.

For the best Cock and Two Hens of any age .	Handsome Silver Cup.
Second Prize	1*l.* 0*s.* 0*d.*

Twelve Entries.

First Prize awarded to Mr. CHUNE, Coalbrookdale.
Second Prize awarded to Mr. G. S. FOX, The Court, Wellington, Somerset.

HAMBURGH (SILVER-SPANGLED).

CLASS 16.

For the best Cock and Two Hens of any age .	Handsome Silver Cup.
Second Prize	1*l.* 0*s.* 0*d.*

Thirteen Entries.

First Prize not awarded.
Second Prize awarded to Mr. J. K. BARTRUM, Bath.

POLANDS (BLACK, WITH WHITE CRESTS).

CLASS 17.

For the best Cock and Two Hens of any age .	Handsome Silver Cup.
Second Prize	1*l.* 0*s.* 0*d.*

Seven Entries.

First Prize awarded to Mr. EDWARDS, Lyndhurst, Hants.
Second Prize awarded to Mr. G. C. ADKINS, West House, Edgbaston, Birmingham.

POLANDS (GOLDEN-SPANGLED).

CLASS 18.

For the best Cock and Two Hens of any age .	Handsome Silver Cup.
Second Prize	1*l.* 0*s.* 0*d.*

Four Entries.

First Prize awarded to Mr. R. H. BUSH, Litfield House, Clifton.
Second Prize awarded to Mr. G. S. FOX, The Court, Wellington.

POLANDS (SILVER-SPANGLED).

CLASS 19.

For the best Cock and Two Hens of any age .	Handsome Silver Cup.
Second Prize	1*l.* 0*s.* 0*d.*

Five Entries.

First Prize awarded to Mr. G. C. ADKINS, West House, Edgbaston, Birmingham.
Second Prize awarded to Mr. DAWSON, Selly Oak, Birmingham.

COCK AND HEN OF ANY DISTINCT BREED.

Class 20.

For the best Cock and One Hen of any age	Handsome Silver Cup.
Second Prize	1*l.* 0*s.* 0*d.*

Eight Entries.

First Prize awarded to Miss Selina H. Northcote, Upton Pyne, near Exeter.

Second Prize awarded to Mr. Coles, Fareham, Hants.

CHICKEN.

Class .

For the best Cock and Two Hens bred since 1st of January,	2*l.* 0*s.* 0*d*
Second Prize	1*l.* 0*s.* 0*d.*

Fourteen Entries.

The First and Second Prizes equally divided between Mr. Edward Archer and Mr. J. R. Rodbard.

BANTAMS.

BANTAMS (Gold-Laced).

Class 21.

For the best Cock and Two Hens	1*l.* 0*s.* 0*d.*
Second Prize	10*s.* 0*d.*

Twelve Entries.

First Prize awarded to Mr. Crocker, Plymouth.

Second Prize awarded to Mr. Uriah Spary, Market Street, Herts.

BANTAMS (Silver-Laced).

Class 22.

For the best Cock and two Hens	1*l.* 0*s.* 0*d*
Second Prize.	10*s.* 0*d.*

Seven Entries.

First Prize awarded to Rev. G. S. Cruwys, Cruwys Morchard Court, near Tiverton, Devon, who took the Silver Cup as the Prize for the best pen of Bantams.

Second Prize awarded to Mr. Uriah Spary, Market Street, Herts.

BANTAMS (White).

Class 23.

For the best Cock and Two Hens	1*l.* 0*s.* 0*d.*
Second Prize	10*s.* 0*d.*

Nine Entries.

First Prize awarded to the Rev. G. S. Cruwys, Cruwys Morchard Court, near Tiverton, Devon.

Second Prize awarded to Mr. G. C. Adkins, West House, Edgbaston, Birmingham.

BANTAMS (Black).

Class 24.

For the best Cock and Two Hens	1*l.* 0*s.* 0*d.*
Second Prize	10*s.* 0*d.*

Nine Entries.

First Prize awarded to Mr. F. G. Stevens, Penn Cross House, Hemyock, Somerset.

Second Prize awarded to the Hon. Miss Dillon, Ditchley, Enstone, Cornwall.

BANTAMS (Any other Variety).

Class 25.

For the best Cock and Two Hens	1*l.* 0*s.* 0*d.*
Second Prize	10*s.* 0*d.*

Two Entries.

First Prize awarded to Mr. T. H. D. Bayly, Ickwell House, Biggleswade.

Second Prize awarded to Mr. T. P. Cottle, Cheltenham.

DUCKS.

DUCKS (White Aylesbury).

Class 26.

For the best Drake and Two Ducks	1*l.* 0*s.* 0*d.*
Second Prize	10*s.* 0*d.*

Nine Entries.

The Prizes were divided equally between Mr. Fowler, Prebendal Farm, Aylesbury, Bucks, and Mr. B. J. Ford, Ide, near Exeter.

DUCKS (Rouen).

Class 27.

For the best Drake and Two Ducks	1*l.* 0*s.* 0*d.*
Second Prize	10*s.* 0*d.*

Four Entries.

First Prize awarded to Mr. Fowler, Prebendal Farm, Aylesbury, Bucks.

Second Prize awarded to Mr. John Marshall, Belmont, Taunton, Somerset.

DUCKS (any other variety).

Class 28.

For the best Drake and Two Ducks	1*l.* 0*s.* 0*d.*
Second Prize	10*s.* 0*d.*

Six Entries.

First Prize awarded to Mr. Fowler, Prebendal Farm, Aylesbury, Bucks.

Second Prize awarded to Mr. John Marshall, Belmont, Taunton, Somerset.

GEESE.

Class 29 (No entry).

TURKEYS.

Class 30.

For the best Cock and Hen . . . . . . 1*l.* 0*s.* 0*d.*
Second Prize . . . . 10*s.* 0*d.*

Two Entries.

First Prize awarded to Mr. J. R. **Rodbard**, Aldwick Court, Langford, near Bristol.

Second Prize awarded to Mrs. **Fookes**, Whitechurch, Blandford, Dorset.

Class 31.—PEA FOWLS (No entry).

PIGEONS—(Of any Age).

Class 32.

For the best Pair of Carriers . . . . . . 10*s.* 0*d.*

Ten Entries.

The Prize awarded to Mr. **Steevens**, Penn Cross House, Hemyock.

Class 33.

For the best Pair of Barbs . . . . . . 10*s.* 0*d.*

Five Entries.

The Prize awarded to Mr. **Steevens**, Penn Cross House.

Class 34.

For the best Pair of Pouters . . . . . . 10*s.* 0*d.*

Twelve Entries.

The Prize awarded to Mr. G. C. **Adkins**, West House, Edgbaston, Birmingham.

Class 35.

For the best Pair of Runts . . . . . . 10*s.* 0*d.*

Five Entries.

The Prize awarded to Mr. **Steevens**, Penn Cross House, Hemyock, Somerset.

Class 36.

For the best Pair of Fantails . . . . . . 10*s.* 0*d.*

Twelve Entries.

The Prize awarded to Mr. **Steevens**, Penn Cross House, Hemyock, Somerset.

Class 37.

For the best Pair of Jacobins . . . . . . 10*s.* 0*d.*

Twelve Entries.

The Prize awarded to Mr. G. C. Adkins, West House, Edgbaston, Birmingham.

Class 38.

For the best Pair of Turbets . . . . . . 10*s.* 0*d.*

Twelve Entries.

The Prize awarded to Mr. Twose, Bridgwater, Somerset.

Class 39.

For the best Pair of Nuns . . . . 10*s.* 0*d.*

Nine Entries.

The Prize awarded to Mr. G. C. Adkins, West House, Edgbaston, Birmingham.

Class 40.

For the best Pair of Archangels . . . . . 10*s.* 0*d.*

Seven Entries.

The Prize awarded to Mr. Steevens, Penn Cross House, Hemyock, Somerset.

Class 41.

For the best Pair of Trumpeters . . . . . 10*s.* 0*d.*

Eleven Entries.

The Prize awarded to Mr. Steevens, Penn Cross House, Hemyock, Somerset.

Class 42.

For the best Pair of Almond Tumblers . . . . 10*s.* 0*d.*

Five Entries.

The Prize awarded to Mr. Twose, Bridgwater, Somerset.

Class 43.

For the best Pair of any other variety of Tumblers . 10*s.* 0*d.*

Seven Entries.

The Prize awarded to Mr. Steevens, Penn Cross House, Hemyock, Somerset.

Class 44.

For the best Pair of Owls . . . . . . 10*s.* 0*d.*

Six Entries.

The Prize awarded to Mr. G. C. Adkins, West House, Edgbaston, Birmingham.

Class 45.

For the best Pair of Dragons . . . . . . 10*s.* 0*d.*

Six Entries.

The Prize awarded to Mr. Burningham, 142, Edgeware Road, Middlesex.

Class 46.

For the best Pair of Dragons, or any other sort of Pigeon 10*s.* 0*d.*

Eighteen Entries.

The Prize awarded to Mr. Hopkins.

COMMENDATIONS OF POULTRY.

Class 1.—Spanish.

*Mr. J. Kilvert, Bartrum, Bath.
Mr. A. G. Brooke, Woodbridge, near Ipswich, Cumberland.

Class 2.—Dorking, *Coloured.*

*Mr. John Kersley Fowler, Prebendal Farm, Aylesbury, Bucks.
*Mr. C. R. Titterton, Birmingham, Warwickshire.

Class 3.—Dorking, *White.*

*Mr. W. Symonds, Jun., Milbourne, St. Andrew, Blandford, Dorset.

Class 5.—Cochin China, *Brown, Partridge, and Grouse.*

*Mr. G. C. Adkins, West House, Edgbaston, Birmingham.
*Mr. Henry Tomlinson, Balsall Heath Road, Birmingham.

Class 6.—Cochin China, *White and Black.*

Mr. Henry Loe, Jun., Appuldurcombe, Godshill, Isle of Wight.

Class 8.—Game, *White and Piles.*

*Mr. G. S. Cruwys, Cruwys Morchard Court, Tiverton, Devon.
*Mr. T. H. D. Bayley, Ickwell House, near Biggleswade, Bedford.

Class 9.—Game, *Black-breasted and other Reds.*

Mr. G. S. Cruwys, Cruwys Morchard Court, Tiverton, Devon.
Mr. J. R. Rodward, Aldwick Court, Langford, near Bristol, Somerset.
Mr. J. R. Rodbard, Aldwick Court, Langford, near Bristol, Somerset.
Mr. J. Fox, Devizes, Wilts.

Class 10.—Game, *Duckwings, and other Greys and Blues.*

*Mr. Charles Edwards, Brockley Court, near Bristol.

Class 13.—Hamburgh, *Golden Pencilled.*

Rev. T. L. Fellowes, Beighton Rectory, Acle, Norfolk.
Mr. A. G. Brooke, Woodbrige, Ipswich, Suffolk.

Class 14.—Hamburgh, *Silver Pencilled.*

*Mr. Edward Archer, Malvern, Worcester.

Class 16.—Hamburgh, *Silver Spangled.*

Mr. Josiah B. Chune, Green Bank, Coalbrookdale, Shropshire.

Class 17.—Polands, *Black and White Crests.*

*Mr. G. S. Fox, the Court, Wellington, Somerset.
*Mr. Thomas Batrye, Brownhill, Upper Brownhill, Holmbridge, near Huddersfield, Yorkshire.

Class 18.—Polands, *Golden Spangled.*

*Mr. R. H. Bush, Litfield House, Clifton.
Mr. John James Fox, Devizes, Wilts.

Class 19.—Polands, *Silver Spangled.*

*Mr. G. C. Adkins, Edgbaston, Warwickshire.
Mr. John James Fox, Devizes, Wilts.
Mr. B. J. Ford, Ide, near Exeter.

CLASS 20.—*Cock and two Hens, of any age, and of any distinct breed, not named in the foregoing classes:—*

*Rev. T. L. FELLOWES, Beighton Rectory, Acle, Norfolk.
Mr. HENRY CHURCHILL, Gloucester.

CHICKEN.

*Mr. J. R. RODBARD, Aldwick Court, Langford, near Bristol.
*Mr. J. K. FOWLER, Prebendal Farm, Aylesbury
*Mr. EDWARD ARCHER, Malvern, Worcester.

CLASS 21.—BANTAMS, *Gold Laced.*

*Miss F. C. MACDONALD, Lympstone, Devon.
Mr. MATTHEW LENO, Jun., Harpenden.

CLASS 22.—BANTAMS, *Silver Laced.*

*Mr. MATTHEW LENO, Jun., Harpenden, near St. Albans, Herts.

CLASS 23.—BANTAMS, *White.*

*Rev. G. F. HODSON, North Petherton, Somerset.

CLASS 24.—BANTAMS, *Black.*

*Mr. W. H. HOLMES, Bridgwater, Somerset.

CLASS 32.—CARRIERS.

Mr. F. C. STEVENS, Hemyock, Wellington, Somerset.
Mr. SAMUEL SUMMERHAYES, Fore Street, Taunton.

CLASS 36.—FANTAILS.

Mr. JOHN MARSHALL, Taunton, Somerset.

CLASS 38.—TURBITS.

Mr. W. B. HELLARD, Willow Cottage, Taunton, Somerset.

CLASS 41.—TRUMPETERS.

Mr. F. G. STEVENS, HEMYOCK, Wellington, Somerset.

CLASS 43. —TUMBLERS (*any other variety*).

*Mr. F. G. STEVENS, Wellington, Somerset.
Mr. G. C. ADKINS, West House, Edgbaston, Warwickshire.

CLASS 44.—OWLS.

*Mr. F. G. STEVENS, Hemyock, Wellington, Somerset.
Mr. EDWARD H. BURGE, Taunton, Somerset.

CLASS 46.—(*Ang other sort of Pigeon*).

*Mr. G. ADKINS, West House, Edgbaston, Warwickshire.
*Mr. S. SUMMERHAYES, Fore Street, Taunton.
Mr. F. G. STEVENS, Hemyock, Wellington, Somerset.
Mr. THOMAS ROSE, Bridgwater, Somerset.
Miss SARAH ANN ELLIOTT, Wilton, Taunton, Somerset.

⁂ Those marked * were *highly* commended.

Awards of Prizes

FOR ESSAYS,

For 1857.

I. On the Labourer . . . . . . Twenty Guineas.

Awarded to Edward Spender, Manna Mead, Plymouth, and T. W. P. Isaac, of Bath, as joint Authors.

II. On Cattle of the West of England £15

Awarded to Henry Tanner, of Puddington Lodge, near Crediton.

III. On Beans and Peas £10

Prize divided between William Crothers, of Belfast, and Professor John Donaldson, 4, North Cumming Street, Pentonville, London.

IV. On the Threshing Machine £20

Awarded to William Heard, of Leiston Works, Saxmundham.

V. On the Management of Dung considered Practically and Chemically £20

Prize divided between E. Spender and T. W. P. Isaac, as joint Authors, and Henry Tanner.

VI. On the Roofing of Farm Buildings £10

Awarded to T. W. P. Isaac, of 13, Northgate Street, Bath, Architect.

Prizes offered
AT THE MEETING OF 1858,
TO BE HELD AT
CARDIFF, IN SOUTH WALES,
ON THE 2ND, 3RD, AND 4TH DAYS OF JUNE.

Prizes for Cattle, Sheep, Horses, and Pigs.

CATTLE.

DEVONS.

	Prizes.
CLASS 1.—For the best Bull, above three years old on the 1st June, 1858	A Silver Cup.
CLASS 2.—For the best Bull, not exceeding three years old on 1st June, 1858	£12
Second ditto	5
CLASS 3.—For the best Bull, not exceeding two years old on 1st June, 1858	10
Second ditto	5
Third ditto	3
CLASS 4.—For the best Cow in Calf (or in Milk, having had a Calf within six months next preceding the first day of the exhibition)	8
Second ditto	4
CLASS 5.—For the best Heifer, in Calf or in Milk, not exceeding three years old on 1st June, 1858	8
Second ditto	4
CLASS 6.—For the best Pair of Heifers, not exceeding two years old on 1st June, 1858, belonging to the same owner	8
Second ditto	4

SHORT-HORNS.

CLASS 7.—For the best Bull, above three years old on 1st June, 1858	A Silver Cup.
CLASS 8.—For the best Bull, not exceeding three years old on 1st June, 1858	£12
Second ditto	5
CLASS 9.—For the best Bull, not exceeding two years old on 1st June, 1858	10
Second ditto	5
CLASS 10.—For the best Cow in Calf (or in Milk, having had a Calf within six months next preceding the first day of the exhibition)	8
Second ditto	4
CLASS 11.—For the best Heifer, in Calf or in Milk, not exceeding three years old on 1st June, 1858	8
Second ditto	4
CLASS 12.—For the best Pair of Heifers, not exceeding two years old on 1st June, 1858, belonging to the same owner	8
Second ditto	4

HEREFORDS.

		Prizes.
Class 13.	For the best Bull, above three years old on the 1st of June, 1858	A Silver Cup.
Class 14.	For the best Bull, not exceeding three years old on the 1st June, 1858	£12
	Second ditto	5
Class 15.	For the best Bull, not exceeding two years old on the 1st June, 1858	10
	Second ditto	5
Class 16.	For the best Cow in Calf (or in Milk, having had a Calf within six months next preceding the first day of the exhibition)	8
	Second ditto	4
Class 17.	For the best Heifer, in Calf or in Milk, not exceeding 3 years old on the 1st June, 1858	8
	Second ditto	4
Class 18.	For the best Pair of Heifers, not exceeding two years old on the 1st June, 1858, belonging to the same owner	8
	Second ditto	4

SHEEP.

LEICESTER, OR LONG-WOOLLED.

(*Not qualified to compete as Cotswold.*)

Class 19.	For the best Yearling Ram	£6
	Second ditto	4
	Third ditto	2
Class 20.	For the best Ram of any other age	5
	Second ditto	3
Class 21.	For the best pen of five Ewes	4
Class 22.	For the best pen of five two-teeth Ewes	5
	Second ditto	3
	Third ditto	2

COTSWOLD.

Class 23.	For the best Yearling Ram	£5
	Second ditto	3
Class 24.	For the best Ram of any other age	4
	Second ditto	2
Class 25.	For the best pen of five Ewes	4
Class 26.	For the best pen of five two-teeth Ewes	5
	Second ditto	3

COTSWOLD DOWN OR OXFORD DOWN.

Class 27.	For the best Yearling Ram	£4
	Second ditto	2
Class 28.	For the best pen of five two-teeth Ewes	4
	Second ditto	2

SOUTHDOWNS.

Class 29.	For the best Yearling Ram	£5
	Second ditto	3

Southdowns—continued.

		Prizes.
Class 30.	—For the best Ram of any other age	£4
	Second ditto	2
Class 31.	—For the best pen of five Ewes	4
Class 32.	—For the best pen of five two-teeth Ewes	5
	Second ditto	3

SHROPSHIRE DOWN OR HAMPSHIRE DOWN.

(*Not qualified to compete as South Downs.*)

Class 33.	—For the best Yearling Ram	£4
	Second ditto	2
Class 34.	—For the best Ram of any other age	3
	Second ditto	2
Class 35.	—For the best pen of five Ewes	4
Class 36.	—For the best pen of five two-teeth Ewes	4
	Second ditto	2

SOMERSET AND DORSET HORNS.

Class 37.	—For the best Yearling Ram	£5
	Second ditto	3
Class 38.	—For the best Ram of any other age	3
	Second ditto	2
Class 39.	—For the best pen of five Ewes	4
Class 40.	—For the best pen of five two-teeth Ewes	5
	Second ditto	3

MOUNTAIN SHEEP.

Class 41.	—For the best Ram of any age	£4
	Second ditto	2
Class 42.	—For the best pen of five Ewes of any age	4
	Second ditto	2

HORSES.

For Agricultural Purposes.

Class 43.	—For the best Mare and foal, or in foal	£10
	Second ditto	5
Class 44.	—For the best two years old Colt	10
	Second ditto	5
Class 45.	—For the best two years old Filly	5
	Second ditto	3
Class 46.	—For the best yearling Colt or Filly	5
	Second ditto	3

Horses for Hacks, or Hunters.

Class 47.	—For the best Mare and foal, or in foal	£5
	Second ditto	3
Class 48.	—For the best two or three years old Filly	5
	Second ditto	3
Class 49.	—For the best yearling Colt or Filly	5
	Second ditto	3
Class 50.	—For the best two or three years old Colt or Gelding	4
	Second ditto	2

PONIES.

	Prizes
Class 51.—For the best Mare Pony of any breed, not exceeding 14 hands high	£4
Second ditto	2
Class 52.—For the best Mare Pony of any breed, not exceeding 13 hands high	4
Second ditto	2
Class 53.—For the best Stallion Pony of the Welsh breed, not exceeding 14 hands high	5
Second ditto	3

PIGS.

Large Breed.

Class 54.—For the best Boar, not exceeding two years old on 1st January, 1858	£4
Second ditto	2
Class 55.—For the best Breeding Sow in farrow, or that has farrowed within four months of the first day of the exhibition	4
Second ditto	2
Class 56.—For the best pen of three Breeding Sows, not exceeding nine months of age on 1st June, 1858	3
Second ditto	2

Small Breed.

Class 57.—For the best Boar, not exceeding two years old on 1st January, 1858	£4
Second ditto	2
Class 58.—For the best Breeding Sow in farrow, or that has farrowed within four months of the first day of the exhibition	4
Second ditto	2
Class 59.—For the best pen of three Breeding Sows, not exceeding nine months of age on the 1st June, 1858	3
Second ditto	2

WELSH CATTLE.

Any Breed.

Class 60.—For the best Bull, not exceeding three years old on the 1st day of June, 1858	£6
Second ditto	3
Class 61.—For the best Bull, not exceeding two years old on the 1st day of June, 1858	5
Second ditto	3
Class 62.—For the best Cow in calf (or in milk), having had a calf within six months next preceding the first day of the exhibition	5
Second ditto	2
Class 63.—For the best Heifer in calf (or in milk), not exceeding three years old on the 1st day of June, 1858	4
Second ditto	

SPECIAL PRIZES.

ANY BREED.

OFFERED BY C. C. WILLIAMS, ESQ.

CLASS 64.—For the best Cow in calf (or in milk), having had calf within six months next preceding the first day of the exhibition	£5
CLASS 65.—For the best pair of Steers, not exceeding three years old on the 1st day of June, 1858	5

The fund for the above two prizes having been specially provided, Classes 64 and 65 are exempt from the general rule of the Society's prizes (which are open to the "United Kingdom,") and *will be confined exclusively to persons residing in South Wales or Monmouthshire;* all cattle, therefore, exhibited in those classes must have been bred in the district of South Wales or Monmouthshire, and be *bonâ fide* the property of the exhibitor.

⁂ Judges have power to expend a sum not exceeding 20*l.* in prizes for Extra Stock.

SPECIAL CONDITIONS.

When the Cows and Heifers are certified to be in Calf, the Prizes awarded will not be paid until a Certificate of Calving has been delivered to the Secretary. The number of live Calves the Cows have had shall be certified.

The Bulls in Classes 1, 2, 7, 8, 13, and 14 shall be certified to be the Sires of live Calves.

The Sheep must be shorn *close* in every part not earlier than the 1st of May. The Judges will be instructed to disqualify *all unfairly shorn.* Ewes (two-teeth excepted) must have each bred a Lamb this season. Lambs may be shown with the Ewes, when not weaned, at the option of the Exhibitor.

No animal of any kind which has gained a First Prize in any Class, at a Meeting of this Society, will be allowed to compete in the same Class at any future Meeting.

No animal can be entered in more than one Class.

Each lot of Ewes must be of the same Flock.

The three Sow Pigs in each pen must be of the same litter.

All Foals must be the offspring of the Mare along with which they are exhibited for a prize.

In all cases where prizes are awarded *conditionally,* they will be withheld until the exhibitor shall have proved to the satisfaction of the Council that the conditions have been complied with.

All animals exhibited must be bonâ fide the property of the exhibitor.

RULES OF ADJUDICATION.

In awarding the Prizes to Cattle, Sheep, and Pigs, the Judges will be especially instructed not to take into consideration the present value to the Butcher of the animals exhibited; but to decide according to their relative merits for the purpose of Breeding.

The Judges will be instructed not to award any prize in classes in which the animals exhibited do not possess sufficient merit.

Regulations for the Exhibition of Live Stock.
1858.

1. Persons intending to exhibit Stock must send in their applications for blank forms of Certificates to the Secretary, No. 16, Pulteney Street, Bath, on or before the 5th of April, 1858—(forms of application can be obtained of the Secretary); on receiving such application the Secretary will forward to each Exhibitor copies of the required form of certificate, which must be filled up and *returned* to him on or *before the* 19*th of April*, 1858. All Forms of Certificate insufficiently or incorrectly filled up will be at once returned to the proposing Exhibitor by the Secretary: and if these are not thoroughly completed in all particulars, the animal to which the certificate refers will be excluded from competition. No Member whose subscription is in arrear will be allowed to exhibit until his Subscription is paid. Non-Members must pay 10*s*. for every head or lot of Live Stock, before obtaining a ticket of admission to bring them into the Show-yard.

2. All persons may exhibit an unlimited number of Animals as Extra Stock, by payment of 5*s*. per lot for Bullocks, Sheep, and Pigs, and 10*s*. for Horses and Colts.

N.B.—*One or more animals, according to the classes, as set out in prize-sheet, shall be deemed a lot.*

3. Any person entering any Stock, and failing to exhibit the same, shall pay a penalty, in the case of Cattle or Horses, of 10*s*., and of Sheep or Pigs of 5*s*., per lot, or be disqualified from exhibiting in future, *unless the non-exhibition of such Stock be caused by the death of the animal or animals, contagious disease, or unavoidable injury.*

4. All Animals intended for exhibition must be brought to the Show-yard on Monday the 31st day of May, between the hours of 10 in the morning and 7 in the evening, and between 7 in the morning and 2 in the afternoon of Tuesday the 1st day of June, OTHERWISE THEY WILL NOT BE ADMITTED. The *parchment ticket*, which will be sent by the Secretary, *must be properly tied on each animal before it is brought to the gate;* and the admission order, which will be also sent by the Secretary, for stock properly entered, *must be delivered to the gatekeeper of the yard by the person who brings the stock for admission.*

5. *All Bulls must have a ring or clamp attached to their nose, and all other cattle be properly secured* to the satisfaction of the Director and Stewards, on being brought to the gate of the yard, or THEY WILL NOT BE ADMITTED.

6. All Servants in charge of Stock, and all Stock brought into the Show-yard, will be subject to the Orders, Regulations, and Rules of the Director and Stewards of the Cattle-yard. Bonâ-fide *Servants only* in charge will be allowed to enter the Show-yard with their Stock.

7. All Stock must remain in the Show-yard until after Two o'clock in the afternoon of Friday the 4th day of June, and as much longer as the Director may deem necessary. The delivery order, filled up and signed by the Exhibitor or his agent, must be delivered up to the gatekeeper:—no Stock can be removed without it.

Note.—Hay, straw, and green food will be provided for the stock whilst in the yard free of expense.

By order of the Council,
H. ST. JOHN MAULE,
Secretary.

October 31*st*, 1857.

Prizes offered

AT THE MEETING OF 1858,

TO BE HELD AT

CARDIFF, IN SOUTH WALES,

ON THE 2ND, 3RD, AND 4TH DAYS OF JUNE.

Prizes for Implements, &c. &c.

SECTION 1.

PREPARATION OF GROUND.

Class.		Prizes.
1.	—For the best application of Steam Power to the Cultivation of Land	£25
2.	—For the best Plough for general purposes	3
3.	—For the best Subsoil Plough	2
4.	—For the best Turnwrest Plough which will efficiently turn the Furrow against the hill	3
5.	—For the best Cultivator, Grubber, and Scarifier (wide)	2
6.	—For the best ditto (narrow)	2
7.	—For the best single or double Drag	1
8.	—For the best set of Harrows	1
9.	—For the best set of Seed-Harrows	1
10.	—For the best Chain Harrow	1
11.	—For the best Clod-crusher or Pulverizer	2

SECTION 2.

CULTIVATION OF CROPS.

Class.		Prizes.
12.	—For the best Corn Drill	£5
13.*	—For the best Corn Drill, for small Occupations, in Hilly Districts	5
14.	—For the best Turnip and Mangold-Wurzel Drill, for ridge or flat, depositing Manure with the Seed	5
15.	—For the best General Drill, capable of distributing at pleasure Liquid Manure with the Seed	5
16.	—For the best General Manure Distributor	5
17.	—For the second best ditto	2
18.	—For the best Horse-Hoe for Green Crops on the ridge and flat	1
19.	—For the best ditto on steep hill-sides, specially adapted to work horizontally along the side of the hill	2
20.	—For the best Machine for setting out Turnips on the ridge or flat preparatory to singling	3
21.	—For the best Hand Machine for filling up vacancies in drilled Green Crops	1

*** For this Prize (13) a simple arrangement to ensure the regular delivery of seed on hill-sides is essential.**

SECTION 3.

HARVESTING CROPS, AND PREPARING FOR MARKET.

Class.		Prizes.
	Reaping Machines (see note *).	
22.	—For the best Hay-making Machine	£2
23.†	—For the most economical and practically useful Portable Steam Engine	10
24.†	—For the second best ditto	5
25.	—For the Portable combined Steam Threshing Machine which shall perfectly prepare the sample for Market	10
26.	—For the most simple and practically useful Portable combined Steam Threshing Machine, not requiring more than 8-Horse power, which shall make the best subdivisions of Corn and Refuse	5
27.	—For the most practically useful Portable Threshing Machine, with Riddle and Straw-Shaker, not requiring more than 3½-Horse power, when worked independently of its horse-gear	3
28.	—For the best Portable Four-Horse Gear, adapted for driving Threshing Machines	2
29.	—For the best Single-Horse Gear for driving Chaff-cutters, &c.	1
30.	—For the best Machine for stamping Seed out of Flax	2
31.	—For the best Machine for Scutching Flax	2
32.	—For the best adaptation of the Threshing Machine for Shelling Clover	2
33.	—For the best Winnowing Machine, which shall be also convertible into a simple blower	3
34.	—For the best One-Horse Cart for general purposes	2
35.	—For the best Two-Horse Waggon, provided with efficient means of checking its speed down hill without dragging or locking the wheels	2

SECTION 4.

PREPARATION OF FOOD FOR STOCK.

36.	—For the best Chaff Cutter, worked by Horse or Steam Power	£2
37.	—For the best Machine for Grating or Pulping Roots	2
38.	—For the best Turnip Cutter	1
39.	—For the best Corn and Pulse Bruiser worked by Horse or Steam power	2
40.	—For the best Oilcake Crusher, for every description of Cake	1
41.	—For the best Gorse Bruiser or Chopper	2
42.	—For the best and most economical Steaming Apparatus for preparing Food for Cattle, Pigs, &c.	2

*** REAPING MACHINES.—The Society will provide rye for the exhibition of Reaping Machines in work; but they refrain from offering a prize, as it is found, from experience, that no satisfactory decision can be arrived at until a later season of the year.**

† Printed Forms, containing Special Regulations for Competition in these Classes (23 and 24), may be obtained from the Secretary.

SECTION 5.

MISCELLANEOUS.

Class.		Prizes.
43.	For the best Churn	£1
44.	For the best Cheese-Press	1
45.	For the best Cooking Apparatus for Farm Kitchens	2
46.	For the best Field Gate, not less than nine feet in length, fitted with Hangings and Fastenings	1
47.	For the best specimen of Substantial Fencing, calculated to resist Cattle of all kinds, constructed either of Iron, Wood, or a combination of both materials, fixed or moveable	1
48.	For the best Self-Acting Valve for the discharge of small streams into tidal rivers	2

SPECIAL PRIZES.

OFFERED BY CHARLES CROFT WILLIAMS, ESQ.

49.	For the best and most useful collection of Agricultural Implements, *bonâ fide* the property of the Exhibitor	£10

OFFERED BY A MEMBER OF THE SOCIETY.

50.	For the best Machine for sowing grain of all kinds broad-cast, capable of being worked by one horse	2

OFFERED BY JONATHAN GRAY, C. C. WILLIAMS, AND T. D. ACLAND, ESQRS.

51.	For the best Specimen of 10 yards of real South Wales White Flannel, three-quarters wide	3
	Second Prize	1

The Prize to be decided by texture and durability.

52.	For the best Specimen of 10 yards of Blue and White, or Red and White Striped Flannel for Gowns, woven in the National Style of South Wales	3
	Second Prize	1

The Prize to be decided by its quality, pattern, and colours.

53.	For the best Specimen of 12 yards of Welsh Fancy Plaid Flannel, adapted for Ladies' Dresses	5
	Second Prize	1

The Prize to be decided by its quality, pattern, and colours.

NOTE.—The Judges will be instructed to award the Prizes to such Implements as shall be found most efficient in proportion to their price, and which combine economy with simplicity and durability.

The Judges will also be empowered to award a "Certificate of Merit" in each Class to such Machine or Implement as shall in their opinion present any features of sufficient novelty in combination or design, or peculiar excellence of workmanship; but which shall, from cost, complexity, or other similar cause, be considered as not coming within the limitation under which the Prizes are to be awarded.

The sum of £10 will be placed at the disposal of the Field and Yard Judges respectively, to be awarded as Extra Prizes for such articles as may not come within the terms of the Prize Sheet, but shall in their opinion, concurrently with that of the Steward of their department, be deserving of such reward.

General Regulations.

1858.

CERTIFICATES AND SPECIFICATIONS.

No Implement or other article will be admitted for exhibition, unless the CERTIFICATE of Notice, properly and completely filled up, be delivered to the Secretary on or before the 1st of April, 1858.

2. The SPECIFICATION and additional particulars, with a *Duplicate*, must in like manner be delivered, *clearly and legibly written*, in the form and manner prescribed, on or before the 19th of the same month. Any omission or informality in this respect will disqualify for exhibition the Implement or other article which is affected by the same.

3. The requisite Forms of *Certificate* and *Specification* will be forwarded on application to the Secretary, at 16, Pulteney Street, Bath.

4. Exhibitors who enter Implements or other articles, and fail to exhibit the same, shall pay to the Director a fine of 2½ per cent. on the value of all such, unless it be proved to the satisfaction of the Stewards that such omission was caused by unavoidable accident.

SHEDDING.

5. The CERTIFICATE of Notice must state the amount of Shed-room desired by the Exhibitor, who will be required to pay for the same at the rate of 2*s*. per foot run, on or before the 1st April, 1858. And in making their applications for space, Exhibitors will take notice that the Society's Shedding is 20 feet in width, and is not more than 7 feet high at the eaves. (*For Special Shedding, see Rule* 10.)

GENERAL ARRANGEMENT.

6. The Yard will be open for the reception of Implements on Wednesday the 26th of May, and Exhibitors will observe that all such as are intended for *Competition* must be unpacked and *in working order* in their several stands by 6 P.M. on Friday the 28th of May, and all others by 7 P.M. on the Saturday following; the whole so to remain at the disposition of the Stewards till 4 P.M. on Friday the 4th of June.

7. Every article, when presented at the gate of the Show-yard, must have on some conspicuous part of it a ticket bearing in legible characters the name of the *Exhibitor* and its *No. in the Specification*. Articles not so ticketed will be refused admission. Exhibitors will therefore observe the necessity of retaining such a memorandum of their Specifications as will ensure their articles being correctly numbered in correspondence therewith.

8. All articles must be arranged in the stands in the order in which they are placed in the Specification, observing that the numbers must run in the same direction as those of the Stands themselves.

9. No article will be allowed to be painted or varnished in the yard, on pain of being removed from the Exhibition; and any on which the paint is wet when presented at the gate will be refused admittance.

10. Exhibitors are at liberty to bring in hay, straw, corn, turnips, &c., for the purpose of exhibiting their Implements in work, which they will be permitted to do on the days of exhibition at such part of the yard and under such

regulations as the Stewards shall appoint. Special shedding, in compartments of 18 feet square, will be provided, at 4*l.* each compartment, for such persons as desire to exhibit their Threshing Machines, &c., at work under cover. Applications and payment for the same to be made by the 1st April, 1858.

TRIALS.

11. Exhibitors who compete for Prizes must, at or before 6 P.M. on Friday the 28th day of May, transmit to the Stewards' Office, in the Yard, personally or by registered letter, a List, signed by themselves or their agents, of the several Implements with which they so compete, and a statement of the Prize for which each Implement is entered. The foregoing Regulation must be strictly observed, as the Judges will make their selection for trial from the above Lists only.

12. Implements which are not entered as above, and in working order in their several stands at the hour named, will be excluded from competition, except it be shown to the satisfaction of the Stewards that the omission arose from circumstances beyond the control of the Exhibitor.

13. Exhibitors will take notice that Threshing Machines competing for Prizes will be driven off a fly-wheel of 5 feet diameter; and other machines driven by Steam off a pulley of 18 inches diameter: in both cases making about 130 evolutions per minute.

☞ Exhibitors of Steam Engines are requested to observe the above intimation.

14. All Hand Machines intended for trial must be provided with 10-inch Driving Pulleys for that purpose.

15. Exhibitors of Steam Engines and other Machines are requested to have them finally arranged and ready for work *on the days named in the programme*, and in the order of the *Trial Lists*, and at the hours specified therein, which will be adhered to as closely as circumstances will admit of. Exhibitors who are not so prepared will be liable to exclusion from the Trials.

GENERAL ORDERS.

16. All Persons and Implements entering the Show-yard will be held subject to the Orders, Rules, and Regulations of the Council, and of the Officers appointed by them.

17. Exhibitors will be required to furnish to customers the Implements exhibited by them, as well as duplicates of the same, at the prices entered in their Specifications.

N.B. The above Regulations will be rigidly adhered to.

By Order of the Council,

H. ST. J. MAULE,
Secretary.

December 1*st*, 1857.

Prizes offered

AT THE MEETING OF 1858,

TO BE HELD AT

CARDIFF, IN SOUTH WALES,

On the 2nd, 3rd, and 4th days of June.

Prizes for Poultry and Pigeons.

POULTRY.

Class		£. s. d.
	SPANISH.	
1.	—For the best Cock and two Hens	A Chased Silver Cup.
	Second Prize	1 0 0
	DORKING (Coloured).	
2.	—For the best Cock and two Hens	A Chased Silver Cup.
	Second Prize	1 0 0
	DORKING (White).	
3.	—For the best Cock and two Hens	A Chased Silver Cup.
	Second Prize	1 0 0
	COCHIN-CHINA (Cinnamon, Buff, or Lemon).	
4.	—For the best Cock and two Hens	A Chased Silver Cup.
	Second Prize	1 0 0
	COCHIN-CHINA (Brown, Partridge, and Grouse).	
5.	—For the best Cock and two Hens	A Chased Silver Cup.
	Second Prize	1 0 0
	COCHIN-CHINA (White and Black).	
6.	—For the best Cock and two Hens	A Chased Silver Cup.
	Second Prize	1 0 0
	BRAMAH POUTRA.	
7.	—For the best Cock and two Hens	A Chased Silver Cup.
	Second Prize	1 0 0
	GAME (White and Piles).	
8.	—For the best Cock and two Hens	A Chased Silver Cup.
	Second Prize	1 0 0
	GAME (Black-Breasted and other Reds).	
9.	—For the best Cock and two Hens	A Chased Silver Cup.
	Second Prize	1 0 0
	GAME (Duckwings and other Greys and Blues).	
10.	—For the best Cock and two Hens	A Chased Silver Cup.
	Second Prize	1 0 0

Class		£ s. d.
	GAME (Blacks and Brassy-winged, except Greys).	
11.—	For the best Cock and two Hens	A Chased Silver Cup.
	Second Prize	1 0 0
	MALAY.	
12.—	For the best Cock and two Hens	A Chased Silver Cup.
	Second Prize	1 0 0
	HAMBURGH (Golden-Pencilled).	
13.—	For the best Cock and two Hens	A Chased Silver Cup.
	Second Prize	1 0 0
	HAMBURGH (Silver-Pencilled).	
14.—	For the best Cock and two Hens	A Chased Silver Cup.
	Second Prize	1 0 0
	HAMBURGH (Golden-Spangled).	
15.—	For the best Cock and two Hens	A Chased Silver Cup.
	Second Prize	1 0 0
	HAMBURGH (Silver-Spangled).	
16.—	For the best Cock and two Hens	A Chased Silver Cup.
	Second Prize	1 0 0
	POLANDS (Black, with White Crests).	
17.—	For the best Cock and two Hens	A Chased Silver Cup.
	Second Prize	1 0 0
	POLANDS (Golden-Spangled).	
18.—	For the best Cock and two Hens	A Chased Silver Cup.
	Second Prize	1 0 0
	POLANDS (Silver-Spangled).	
19.—	For the best Cock and two Hens	A Chased Silver Cup.
	Second Prize	1 0 0
20.—	For the best Cock and two Hens, of any age and of any distinct breed, not named in the foregoing classes.	A Chased Silver Cup.
	Second Prize	1 0 0
21.—	Three Silver Chased Cups will be given as a First Prize, and the Society's Medals as a Second Prize, for the best Pens (Cock and two Hens) of Chickens of any breed. See note.[*]	
	SPANISH.	
[†]22.—	For the best Cock, of any age	A Chased Silver Cup.
	Second Prize	The Society's Medal.

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[*] A Prize of 1*l.* will be given to the best Pen of Chickens shown in this class, considered entirely with regard to table purposes. Cross-bred birds competing for this prize must have their origin stated. Absence of offal, whiteness of skin and fat, early maturity and size, will be chiefly considered.

[†] The Cups for single Birds in Classes 22, 23, and 24, will not be given unless the entries for competition exceed 12 in each class. Entrance fee, 5*s.* each.

DORKING (OF ANY VARIETY).

Class		£.	s.	d.
†23.—For the best Cock, of any age		A Chased Silver Cup.		
	Second Prize	The Society's Medal.		

GAME (OF ANY VARIETY).

Class		£.	s.	d.
†24.—For the best Cock, of any age		A Chased Silver Cup.		
	Second Prize	The Society's Medal.		

BANTAMS (GOLD-LACED).

Class		£.	s.	d.
25.—For the best Cock and two Hens		1	0	0
	Second Prize	0	10	0

BANTAMS (SILVER-LACED).

Class		£.	s.	d.
26.—For the best Cock and two Hens		1	0	0
	Second Prize	0	10	0

BANTAMS (WHITE).

Class		£.	s.	d.
27.—For the best Cock and two Hens		1	0	0
	Second Prize	0	10	0

BANTAMS (BLACK).

Class		£.	s.	d.
28.—For the best Cock and two Hens		1	0	0
	Second Prize	0	10	0

BANTAMS (OF ANY OTHER VARIETY).

Class		£.	s.	d.
29.—For the best Cock and two Hens		1	0	0
	Second Prize	0	10	0

A chased Silver Cup will be given in lieu of money to the best Pen of Bantams.

DUCKS (WHITE AYLESBURY).

Class		£.	s.	d.
30.—For the best Drake and two Ducks		1	0	0
	Second Prize	0	10	0

DUCKS (ROUEN).

Class		£.	s.	d.
31.—For the best Drake and two Ducks		1	0	0
	Second Prize	0	10	0

DUCKS (ANY OTHER VARIETY).

Class		£.	s.	d.
32.—For the best Drake and two Ducks		1	0	0
	Second Prize	0	10	0

GEESE.

Class		£.	s.	d.
33.—For the best Gander and Goose		1	0	0
	Second Prize	0	10	0

TURKEYS.

Class		£.	s.	d.
34.—For the best Cock and Hen		1	0	0
	Second Prize	0	10	0

PEAFOWLS.

Class		£.	s.	d.
35.—For the best Pen of Peafowls		1	0	0
	Second Prize	0	10	0

PIGEONS.

A chased Silver Cup will be given, and the Society's Bronze Medal as a second extra Prize, to the Exhibitors obtaining the greatest number of Prizes for Pigeons.

	£.	s.	d.
36.—For the best pair of Carriers	0	10	0
37.—For the best pair of Barbs	0	10	0
38.—For the best pair of Pouters	0	10	0
39.—For the best pair of Runts	0	10	0
40.—For the best pair of Fantails	0	10	0
41.—For the best pair of Jacobins	0	10	0
42.—For the best pair of Turbits	0	10	0
43.—For the best pair of Nuns	0	10	0
44.—For the best pair of Archangels	0	10	0
45.—For the best pair of Trumpeters	0	10	0
46.—For the best pair of Almond Tumblers	0	10	0
47.—For the best pair of any other variety of Tumblers	0	10	0
48.—For the best pair of Owls	0	10	0
49.—For the best pair of Dragons	0	10	0
50.—Any other sort of Pigeon	0	10	0

CONDITIONS AND REGULATIONS.

All Exhibitors will be required to pay for coops, food, attendance, &c., as follows:—

To Class 24 inclusive	5*s.* 0*d.*	per pen.
Turkeys, Geese, and Peafowls	5*s.* 0*d.*	,,
Bantams and Ducks	3*s.* 6*d.*	,,
Pigeons	2*s.* 6*d.*	,,

The above fees include the free delivery of all birds to and from the Show-yard to the railway station, *but all carriage must be pre-paid* to the Cardiff station, or *the specimens sent by railway will not be removed from there.*

All Certificates of entry must be forwarded to Mr. John Kingsbury, Honorary Secretary, 10, Hammet Street, Taunton, together with the amount of fees chargeable at the above rates, on or before the 1st of May, 1858, on printed blank forms, which will be furnished by him on application.

Exhibitors must state the price, breed, and age (if possible), calculated up to the day of exhibition, of their specimens, on their certificates; and all birds competing for any chicken's prize must have their *exact ages* entered thereon. And a sale *must take place* if the price be offered through the Secretary.

High condition, quality, beauty of plumage, purity of race, and uniformity in the markings, combs, and other characteristics, will, in all the classes for Fowl, be taken into consideration by the Judges in a greater degree than mere weight without these distinctions, if the more perfect specimens are at the same time of a fair average size.

All specimens must be *bonâ fide* the property of the Exhibitor; the discovery of any wilful misstatement will exclude the Exhibitor from all future Exhibitions.

The Judges will be empowered to withhold any prize where specimens are not considered of sufficient merit.

The Poultry department will be subject to the rules and regulations of the Steward.

The Society's Bronze Medals will be given, if desired, in lieu of Second Money Prizes.

The Great Western Railway Company, Bristol and Exeter Railway Company, North and South Devon Railway Company, South Wales Railway Company, and Midland Counties and Rhymney Railway Company, have consented to take birds to and from the Exhibition at half the usual rates of charge. No charge will be made for conveyance from the Railway to the place of exhibition.

All the specimens intended for exhibition must be at the Show-yard *before* 12 o'clock on the noon of Tuesday the 1st of June, otherwise they will not be admitted; and no specimen can be removed before 4 o'clock at noon of Friday the 4th of June.

All Eggs laid will be destroyed.

It is particularly desired that no birds be sent unless in a perfectly healthy condition.

All birds to which prices have been affixed may be claimed at the price put upon them after 3 o'clock on the first day. Application to be made at the Secretary's office, where all sales must be effected, and payment made when the birds are claimed.

Exhibitors are particularly requested carefully to examine the Prize Lists and Regulations of the Show, in order to avoid errors in making their entries. It must also be understood that *no alteration can be made in the prices as stated on the certificates,* and set forth in the Catalogue; that the specimens must be *sold in pens, and not divided;* and that the persons who have the management of the sales cannot take charge of fowl which are disposed of privately. Attention to these regulations will greatly facilitate the business of the Show, and prevent errors in the accounts, and in the despatch of the specimens at the close.

The Steward pledges himself to take every care of the Poultry forwarded for competition, but will not in any case be responsible for any unforeseen accident, loss, or mistake that may possibly occur.

In case of the death of any Poultry during the time of exhibition, the bird or birds so lost will be sent back for the inspection of the Exhibitor.

A charge of 10 per cent. will be made for all birds sold.

All parties *applying* to the Secretary for Certificates to enclose a postage stamp.

All birds purchased must pay full railway fare from the show.

Steward of the Department.

SAMUEL PITMAN, Rumwell Lodge, Taunton.

Secretary.

JOHN KINGSBURY, Hammet Street, Taunton.

Prizes offered
FOR ESSAYS
For 1859.

FOR THE BEST AND APPROVED ESSAY ON

I. Steam Cultivation £25

1. A clear explanation of the agricultural object to be aimed at in the application of steam to tillage; how far the pulverisation of the soil ought to be effected by the machine at the time of its action; how far to be left to the subsequent action of the atmosphere.
   The consequent distinction to be drawn between the mechanical means used.
2. A short account of the principal inventions already before the public; the advantages and disadvantages of each,—1, as to efficiency; 2, as to prime cost; 3, as to wear and tear; 4, as to expenditure of power in moving the engine, in friction, or other non-effective action.
3. The principal desiderata at the present time, in order to make steam practically applicable to tillage.

II. The best method of Training Farm-servants . . . £15

The influence of the labourer's home.
The influence of the master's home.
Industrial schools—
  How far effective as schools.
  How far effective as giving practical habits of work.
Suggestions for combining mental and moral training with the earning of wages.
The half-time system, how far applicable to farm-work.
Voluntary apprenticeship.

III. The comparative value of different kinds of Food for Live-Stock, with reference both to produce of meat and manure £20

Hay, roots, corn, and cake to be specially treated.
Any new or imported food.
What constituents of food are most important to growing stock, and what to full-grown stock preparing for the butcher.
Origin and uses of fatty or oily matter in food.
Do the fatty matters enrich the manure?
Some data for calculating the increased value of manure due to food of various qualities.

IV. THE CONNECTION BETWEEN THE WEST OF ENGLAND AND SOUTH WALES £20

The resemblances and differences of the two districts as to physical geography and climate.

A comparison of the agriculture of the two districts.

The existing modes of transit and means of improving them.

The mutual dependence of the two districts as to mineral and agricultural produce, and generally as to agriculture, arts, manufactures, and commerce.

V. PIGS £15

A very short description of the principal breeds of pigs in England.

The physiological distinctions between large breeds and small breeds, and consequent practical difference of treatment with a view to profit (see Rowlandson's Essay, Royal Agricultural Journal, vol. xi. p. 574).

The treatment of young pigs.

The diseases of pigs.

The pig-sty.

The poor man's pig.

The best mode of curing and keeping bacon.

Comparison of the value of bacon with other kinds of human food.

VI. POTATOES £10

The principal sorts.

Early and late planting.

The mode of cultivation adopted in districts famous for potato growing.

The connection of the disease (if any) with particular soils, manures, or modes of cultivation, as established by well-recorded experience.

Mere hypothesis unsupported by direct experiment must be excluded.

VII. AUTUMN CULTIVATION £10

Its object.

The best methods on different soils.

The question of applying dung in autumn.

The profit (or the reverse) of a winter catch-crop to be calculated.

N.B.—Essays not to be sent in till JUNE 1*st instead of* MARCH 1*st.*

RULES

RULES OF COMPETITION FOR PRIZE ESSAYS.

1. All competitors shall enclose their names and addresses in a sealed cover, on which only their motto, and the subject of their Essay, and the number of that subject in the Prize List of the Society, shall be written. Competitors are requested to write their motto on the paper on which their names are written, as well as on the envelope.

2. The President or Chairman of the Council for the time being shall open the cover on which the motto designating the Essay to which the Prize has been awarded is written, and shall declare the name of the author.

3. The Members of the Journal Committee shall alone be empowered to open the motto-paper of such Essays, not obtaining the Prize, as they may think likely to be useful for the Society's objects, with a view of consulting the writer confidentially as to his willingness to place such paper at the disposal of the Journal Committee.

4. The copyright of all Essays gaining prizes shall belong to the Society, who shall accordingly have the power to publish the whole or any part of such Essays; and the other Essays will be returned on the application of the writers; but the Society do not make themselves responsible for their loss.

5. The Society is not bound to award a prize unless they consider one of the Essays deserving of it.

6. In all reports of experiments the expenses shall be accurately detailed.

7. The imperial weights and measures only are those by which calculations are to be made.

8. No prize shall be given for any Essay which has been already in print.

9. All Essays must be addressed to the Secretary, H. St. John Maule, Esq., 16, Pulteney Street, Bath, on or before the 1st of June, 1859.

The competitors are requested to write only on one side of each leaf of paper, and to leave a margin of at least one inch.

NOTE.—One of the objects for which the above prizes are offered being to render *more generally known the recorded experience of practical men*, competitors are at liberty to refer to papers already in print, provided that the sources from which their information is drawn be distinctly acknowledged (the title and page being given), and that the subjects are treated in a plain and practical manner.

NOTICE TO AUTHORS NOT COMPETING FOR PRIZES.

The Journal Committee are authorized by the Council to engage literary assistance to a limited extent, and will therefore be happy to enter into communication with any author willing to contribute to the Journal. There is a great deal of instructive matter in scattered papers, which may with advantage be collected and made to bear on the practice of the West of England. Some of the "common things" of General Science may also be usefully treated in reference to practical farming. (See note to Rules of Competition, above.) Address to the care of W. Roberts, Assistant Secretary, Broadgate, Exeter.

List of Members.

CORRECTED TO MAY, 1858.

Names thus (*) distinguished are Governors.
Names thus (†) distinguished are Life Members.

⁎ *Members are particularly requested to make the Secretary acquainted with any errors in the names or residences.*

Name.	Residence.	Subscriptions.		
		£.	s.	d.
†WALES, HIS ROYAL HIGHNESS THE PRINCE OF, per J. R. Gardiner, Esq.	. . . .		. .	
Abbott, C. H.	Long Ashton, Bristol	1	1	0
*Acland, Sir T. D., Bart.	Killerton, Exeter	5	0	0
*Acland, Sir P. Palmer, Bart.	Fairfield, Bridgwater	10	0	0
*Acland, T. D.	Sprydoncote, Exeter	5	0	0
Adair, Desmond	Heatherton Park, Taunton	1	0	0
†Adair, A.	Heatherton, Taunton		. .	
Adair, Capt. A. W.	Heatherton, Taunton	1	1	0
Adams, John	Frittiscombe, Stokenham, Kingsbridge	0	10	0
Adams, William	Marldon, Torquay		. .	
Addams, C.	Holford, Bridgwater	0	10	0
Addington, Hon. W. W.	Up-Ottery, Honiton	1	1	0
Addington, H. John	Langford Court, near Bristol	1	0	0
Adney, Capt. Henry	Lympstone, Exeter	1	0	0
Alford, Henry	Taunton, Somerset	1	1	0
Alford, W.	Plaistow, Barton Shirwell	0	10	0
Allcock, Thomas	Ratcliffe-on-Trent	0	10	0
Allen, Francis Thomas	West Kington, near Chippenham	1	1	0
Allen, J. R.	Lyngford House, Taunton	1	0	0
†Ames, John	Clevelands, Lyme		. .	
*Amory, John Heathcoat	Tiverton	2	2	0
Andrews, Genge Henry	Rimpton, Sherborne	0	10	0
Anley, Baldwin	Exeter	0	10	0
Anstey, John	Combe Lancey, Sandford, Crediton	0	10	0
Anstey, Samuel	Menabilly Farm, Fowey, Cornwall	0	10	0
Anthony, John	Yealmpton	0	10	0
Anthony, Rd. B.	Marldon, Torquay	0	10	0
Antrobus, Sir Edmund, Bart.	Hyde Park Corner, London	1	1	0
†Archer, Edward	Southfield House, Great Malvern	1	1	0
Arnold, G.	Harepath, Beaford, Eggesford	0	10	0
Arnold, G., jun.	Brightley, Dolton, Eggesford	0	10	0

Name.	Residence.	Subscriptions.		
		£.	s.	d.
Arnold, Capt. W.	Nethercot, Winkleigh, Eggesford	1	0	0
*Ashburton, Lord	The Grange, Arlesford, Hants .	5	0	0
Ashford, John	Loxbear, Tiverton	0	10	0
Ashford, W.	Venmore, Woodbury, Exeter .	0	10	0
*Auckland, Baron, the Right Hon. and Right Rev.	Lord Bishop of Bath and Wells .	2	0	0
Avery, William, and Co. . .	Barnstaple.	0	10	0
Avery, George	Upcot, Braunton, Barnstaple. .	0	10	0
Babb, William	Ashbrittle, Wellington . . .	0	10	0
Babbage, Christopher . . .	Bridgwater.	0	10	0
Babbage, William Pitt. . .	Milverton, Somerset.	0	10	0
Badcock, H.	Taunton	1	0	0
Badcock, R. G.	Taunton	1	0	0
Badham, G. D.	The Sparrowes Nest, Ipswich. .	1	0	0
Bailey, C. D..	Bath	1	1	0
Bailey, Henry	Walgaston Farm, Berkeley . .	0	10	0
Bailey, James	Nynehead, Somerset	0	10	0
Bailey, James	Dowland Farm, Axmouth . .	0	10	0
Baillie, Hamilton	Ash Hall, Cowbridge, Glamorgan	1	1	0
Bailward, J.	Horsington	1	1	0
Baker, H. J.	Charlton, Horethorne	0	10	0
*Baker, Sir Edward B.. . .	Ranston, Blandford			
Baker, Thomas	Cartuther, Liskeard.	0	10	0
Baker, William	West Johnson, South Molton .	0	10	0
Baldson, J.	West Leigh, Bideford	0	10	0
Baldson, William	Marwood, Devon	0	10	0
Bale, James	Westcott Farm, Barnstaple . .	0	10	0
Barrett, Edward.	Taunton	0	10	0
Barrett, Exall, and Co. . .	Reading	1	0	0
Barrett, W.	North Curry, Taunton	1	1	0
Barrette, Geo. A.	Bath	0	10	0
Bartlett, Wm.	Ilsham, Torquay	1	0	0
Barton, C.	Holebrook House, Wincanton .	1	0	0
*Bastard, Baldwin J. . . .	Kitley, Yealmpton	2	0	0
Bastard, T. C.	Charlton, Musgrove.	1	1	0
Bastard, W.	Slapton, Dartmouth	0	10	0
Batchellor, William . . .	Bath	0	10	0
Bater, Robert	Drake's Farm, Upexe, Silverton.	0	10	0
Batten, John, jun.	Aldon, Yeovil	1	0	0
†Baxendale, Joseph . . .	Woodside, Hertford.		. .	
Beachim, Zebedee	Mells, Frome	0	10	0
Beadon, William	Otterhead, Honiton	1	0	0
Beague, C. P.	Dulverton, Somerset	1	0	0
Bean, H. L.	Ashcott, Glastonbury	1	1	0
Beare, Henry	Ilsington, Newton Abbot . . .	0	10	0
*Bedford, Duke of	Endsleigh, Tavistock	10	10	0
Beevor, Rev. W.	Cowbridge	1	1	0
Belfield, J.	Parkfield, Torquay	1	0	0
Belfield, Rev. F.	Primley Hill, Torquay. . . .	1	0	0

Name.	Residence.	Sub-scriptions.		
		£.	s.	d.
ıfield, Edmund	Silton Farm, Bourton, Dorset	0	10	0
afield, George	Maperton Farm, Wincanton	0	10	0
ıett, Rev. H.	Sparkford, Castle Cary	1	0	0
ıett, Thomas	Morchard Bishop, North Devon	0	10	0
on, John	Tavistock	1	0	0
ɪon, Rev. J. P.	Witheridge	1	1	0
all, Edward Hammond	Heybridge, Maldon	1	0	0
ard, William H.	Cottington, Sidmouth	1	1	0
y, R. L.	Chagford, Exeter	0	10	0
ey, John	Dypford, Bampton	0	10	0
y, W. H.	Dunmore House, Bradninch	1	0	0
ss, John	Lydling, Dorchester	1	0	0
ford, ——	Palace, Crediton	1	0	0
nell, W.	Milton, Martock	0	10	0
, Thomas	Leicester House, Great Dover Street, London, S.E.	0	10	0
, Robert	Newton St. Loe, Bath	1	0	0
ıingham, Robert	Holnicote, Minehead	0	10	0
ıingham, Wm.	Broadclyst, Exeter	0	10	0
op, John Mullett	Cleeve, Bristol	0	10	0
op, William Richard	Exeter	1	0	0
kburrow, John	Towerhead, Banwell, Somerset	1	1	0
e, Henry	St. Erney, Landrake	0	10	0
e, John	Ackland Barton, Barnstaple	0	10	0
e, J. W.	Venne House, Wiveliscombe	1	0	0
dford, Henry	Sandridge, Bromham, Chippenham	0	10	6
dford, H.	Baynton, Westbury	0	10	0
ht, William	Stoke Gabriel, Torquay	0	10	0
ıart, John	Willett House, Taunton	1	0	0
ey, Alfred	Exeter	1	0	0
ey, John	Stockleigh Pomeroy, Crediton	1	0	0
s, Rev. J. T.	Exmouth	1	0	0
l, A.	Orchard Portman, Taunton	0	10	0
l, James	Heathfield, Taunton	0	10	0
l, Thomas	North Petherton, Bridgwater	0	10	0
her, Charles	Wiveliscombe	0	10	0
her, W.	Wiveliscombe	0	10	0
ne, John W.	Ilchester	0	10	0
ne, Robert	Totnes	0	10	0
ıfield, Edward	Sticklepath, Okehampton	0	10	0
ıverie, Hon. Pleydell P., .P.	Brymore, Bridgwater	5	0	0
verie, P. P., jun.	Brymore, Bridgwater	1	0	0
den, John	Ipplepen, Newton Abbot	1	0	0
hay, J. L.	Modbury	0	10	0
ly, Edward	Siddington House, Cirencester	1	0	0
ley, Thomas	Bishop's Tawton, Barnstaple	0	10	0
ley, W.	Hillside, Tawstock, Barnstaple	0	10	0
ıridge, John	High Bickington, Barnstaple	1	0	0
ıridge, Thos. J.	Exeter	1	1	0
ıt, Robt., M.D.	Sydney Cottage, Woodbury, Exeter	1	0	0
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Name.	Residence.	Subscriptions.		
		£.	s.	d.
Brereton, Rev. J. L.	West Buckland, South Molton	1	1	0
Brinsmead, Thomas	St. Giles, Great Torrington	0	10	0
Broadmead, Philip	Olands, Milverton	1	0	0
Brook, Joseph	Brinsmore Tree, Yeovil	0	10	0
Brook, John	Aldon Farm, Yeovil	0	10	0
Broom, John	Holcombe Barton, Ottery St. Mary	0	10	0
Broom, John	Culmstock, Wellington, Somerset	0	10	0
Brown and Co.	Bridgwater	0	10	0
Brown and May	Wilts Foundry, Devizes	2	0	0
Brown, Thomas	Plympton, Plymouth	0	10	0
Browne, Thomas Beale	Salperton Park, Andoversford	1	0	0
Brunel, I. K.	Westminster	1	1	0
Bryant, James	Prospect, Plymouth	1	0	0
*Buck, Lieut.-Col.	Hartland Abbey, Bideford	2	0	0
Buckingham, J., jun.	Clothworthy Farm, South Molton	0	10	0
Buckingham, W.	Exeter	1	0	0
Bull, Uriah	Mells, Frome	0	10	0
*Buller, James W., M.P.	Downes, Crediton	3	3	0
Buller, Wm. Wentworth	Strete Ralegh House, Whimple, Exeter	1	0	0
†Bullock, George	North Coker, Yeovil		. .	
†Bullock, George Troyte	North Coker		. .	
Bult, James S.	Kingston, Taunton	0	10	0
Bulteel, John	Pamphlete, Ermebridge	1	0	0
Bunt, Petherick	Exford, near Minehead	0	10	0
Burnard, C. F.	Lambhay, Plymouth	1	0	0
Burnett, Alexander	Rosehill, Merton, Eggesford	1	0	0
Burnett, John	Pynecome, Wiveliscombe		. .	
Burrington, T.	Pinson Barton, Colebrook, Crediton	0	10	0
Burrow and Page	Morchard Bishop, North Devon	0	10	0
Burston, James	Colton Farm, Nettlecombe, Taunton	0	10	0
Burton, Richard	Broadclyst, Exeter	0	10	0
Burton, Samuel	Broadclyst, Exeter	0	10	0
Busby, William	Newton-le-Willows, Bedale, Yorkshire	1	0	0
Bush, Clement	Weston, Bath	1	0	0
†Bush, J. D.	Bath		. .	
Bush, R. H.	Litfield House, Clifton	1	0	0
Butland, Robt.	Paignton, Torquay	0	10	0
Butter, John, M.D.	Windsor Villas, Plymouth	1	0	0
Butcher, William	Exeter	1	0	0
Cambridge and Co.	Iron Works, Bristol	2	0	0
Cannicott, John	Donyatt, Ilminster	1	0	0
Capel, Arthur	Bulland Lodge, Wiveliscombe	1	1	0
Card, John	Norton Ferris	0	10	6
*Carew, John	Exeter	2	0	0
Carew, John	Crocombe Court, Taunton	1	0	0

Name.	Residence.	Sub-scriptions.		
		£.	*s.*	*d.*
ew, Sir W. P., Bart.	Haccombe, Newton Abbot	. .		
ew, Thos.	Collipreist, Tiverton	. .		
ew, W. P.	Antony, Devonport	2	0	0
narvon, Earl of.	High Clere, Newbury	2	0	0
ell, John	Outer Yard, Silverton	0	10	0
ington, H. E.	*Chronicle Office*, Bath	0	10	6
on, Hugh	Warminster	0	10	0
rithen, Rev. J. C.	Challacombe, Barnstaple	0	10	0
, Stanley Edward	Follaton House, Totnes	1	0	0
r, Wm.	Cold Ashton, Bath	0	10	0
an, The Earl	Hill House, Bridgwater	2	0	0
craft, William	Bramshott House, Liphook, Hants	0	10	0
npernowne, Rev. Richard	Vineyard, Dartington, Totnes	1	0	0
mon, T.	Wishford, Broadclyst	0	10	0
dler, Thomas	Aldbourne, Hungerford	0	10	0
ter, John	Arnold Terrace, Bow Road, London, E.	1	0	0
man, James	Widworthy, Honiton	1	0	0
ple, William	Gornhay, Tiverton	0	10	0
d and Munro	Bristol	1	0	0
e, Edwd.	Woodhays, Tiverton	0	10	0
e, Wm.	Zeals, Bampton	0	10	0
k, John	Halse, Milverton	0	10	0
ds,	Clist St. George	. .		
bb, James Richmond	Montacute, Yeovil	0	10	0
rchill, H.	Morchard Bishop, North Devon	1	0	0
k, Charles	Printer, Bath	1	0	0
ke, Cyrus	Street, near Glastonbury	0	10	0
ke, C. G.	Dumbleton, Evesham	0	10	0
ke, Edward	Chard	1	0	0
ke, Harry	Cloford, Frome	0	10	0
ke, Jas.	Street, near Glastonbury	0	10	0
ke, John Aubrey	Street, near Glastonbury	0	10	0
ke, John	Luccombe, Minehead	0	10	0
ke, R. H.	Bridwell House, Collumpton	1	0	0
rke, T. E.	Tremlet House, Wellington	. .		
ke, William	East Lynch Farm, Minehead	0	10	0
ton, Shuttleworth, and Co.	Lincoln	2	2	0
ents, W.	Gilscot Farm, Alwington	0	10	0
k, Edmund H.	Westholme, Shepton-Mallet	1	0	0
k, Robt.	Westholme, Shepton-Mallet	1	0	0
fford, Lord	Ugbrook, Chudleigh	. .		
nton, The Lord	Heanton Satchville, Eggesford	5	0	0
es, W.	Garrett's, Banstead, Epsom	1	1	0
es, George	57, Russell Square, London, W.C.	1	1	0
er, George	Old Newnham, Plympton St. Mary	0	10	0
er, W. K.	Court Barton, Charlton, Kingsbridge	0	10	0
e, Henry	Sherborne, Dorset	0	10	0
, John	Clysthydon, Collumpton	0	10	0
, John	Tutshill Farm, Abbotsham	0	10	0

Name.	Residence.	Subscriptions.		
		£.	*s.*	*d.*
Cockey and Sons	Frome	1	0	0
Colborne, Edward	Clapton Farm, Cucklington	0	10	6
Coleman, Richd.	Chelmsford	0	10	0
Coleridge, F. J.	Ottery St. Mary	1	0	0
Coleridge, Rev. E. E.	Buckerell, Honiton	1	0	0
Coles, Wm. Carey	Yew-tree Farm, Yeovil	0	10	0
Collier, James	Culmstock, Wellington, Somerset	0	10	0
Collins, John	Wonham House, Bampton	1	1	0
Collins-Splatt, H.	Brixton House, Plympton	1	1	0
Collyns, Charles Palk	Dulverton, Somerset	1	1	0
Colthurst, C. T.	Thurloxton, Bridgwater	0	10	0
Colthurst, John	Chew Court, Chewmagna	1	0	0
*Combe, R. T.	Earnshill, Taunton	2	0	0
Comins, James	South Molton	0	10	0
Coniam, Thomas Taylor	Chagford, Devon	0	10	0
Conolly, C. J. T.	Cottles House, Bradford, Wilts	1	0	0
Cook, Nathaniel	Aysford Court, Burlescombe, Wellington, Somerset	0	10	0
Cook, N.	Goosemore, Halberton, Tiverton	0	10	0
Cook, Robert	Tiverton, Devon	0	10	0
Cook, T. C.	Tiverton, Devon	0	10	0
Coom, Henry	Duchy of Cornwall Office, Lostwithiel, Cornwall	0	10	0
Cooper, G.	Exeter	0	10	0
Copleston, Rev. J. G.	Offwell, Honiton	1	0	0
Copp, Charles	Cutton, Poltimore, Exeter	0	10	0
Coram, Stephen	Trull, Taunton	0	10	0
Cording, John	Bathealton, Wellington	0	10	0
Corfield, Charles Cox	Taunton	0	10	0
Corner, Edward	Woodland, Holford	0	10	0
Corner, J. B.	Longforth, Wellington	0	10	0
Corner, Richard	Torweston, Williton	0	10	0
Corner, R.	Chidgeley, Nettlecombe, Taunton	0	10	0
Corner, W.	Woolcotts, King's Brompton	0	10	0
Cornes, James	Barbridge, Cheshire	1	0	0
Cornish, Thos. R.	Hayes Farm, Ideford, Chudleigh	0	10	0
Coryton, Augustus	Pentillie Castle, Plymouth	1	0	0
Cosens, W.	Langdon, Dawlish	1	0	0
†Cotterell, Jacob Henry	Bath	.	.	
Cotterell and Spackman	Bath	1	0	0
Cotton, Gilbert Knill	Chemist, Barnstaple	0	10	0
Cotton, J. K., and Son	Wine Merchants, Barnstaple	0	10	0
Courtenay, Lord	Powderham Castle, Exeter	1	0	0
Cox, E. G.	Fore Street, Taunton	0	10	0
Cox, Isaac	Whatley, Frome	0	10	0
Cox, Stephen	Langton Court, Brislington	1	0	0
Cozans, Robert	Pilton, Shepton-Mallet	0	10	0
Craddock, F.	Lyppiat, Stratton, Bath	1	0	0
Crang, James	Timsbury	1	0	0
Crawshay, R. T.	Cyfartha Castle, Merthyr Tydvil	1	1	0

Name.	Residence.	Sub-scriptions.		
		£.	s.	d.
d, John	Whiddon, Abbotskerswell	1	0	0
pin, Henry	Chulmleigh	1	1	0
ker, J. B.	Northover, Ilchester	0	10	0
ker, Richard	Whimpston, Modbury	0	10	0
sman, W.	Paignton, Torquay	0	10	0
wys, Rev. G. S.	Cruwys Morchard House, Tiverton	1	1	0
verwell, James	Classey Farm, N. Petherton	0	10	0
verwell, J. Woodhouse	Overton Farm, West Monckton	0	10	0
ning, Elias	Moreton Hampstead	0	10	0
onshire, His Grace the Duke of	.. ..	5	0	0
apier, S., Capt.	Collinshayes, Bruton	1	0	0
ger, Thomas	Huntstile, near Bridgwater	0	10	0
by, Edward	Kerswell Farm, Hockworthy	0	10	0
rcy, William Francis	Abbott's Bury, Newton Bushell	1	0	0
id, Evan	Radyr Court, Cardiff	1	0	0
vie, Sir H. R. F., Bart., .P.	Creedy Park, Crediton	3	3	0
is, F. A.	Bridestowe, Okehampton	0	10	0
is, Geo. Venn	Fitzhead, Milverton	0	10	0
vis, Henry	Oakhill, near Bath	2	2	0
y, James	North Molton	0	10	0
y, J. Tanner	Roseash, South Molton	1	0	0
ys, Fras.	Gifford's Farm, Bampton	0	10	0
w, J.	Exeter	2	0	0
ve, Michael	East Chinnock	0	10	0
vson, W. and F.	Market Place, Bath	0	10	0
vson, William	Exeter	1	0	0
, Samuel	Culverhouse Farm, Dunsford, Exeter	1	0	0
ing, J.	Cotley Farm, Ottery St. Mary	0	10	0
ning, J.	Ottery St. Mary	1	0	0
nis, J.	Sticklepath, Tawstock	0	10	0
ry, W	5, Lansdown Place, Plymouth	1	0	0
von, Earl of	Powderham Castle, Exeter		. .	
vdney, George	Hollond, Plympton St. Mary	0	10	0
ker, J. and W.	Chagford, Exeter	0	10	0
ckinson, F. H.	Kingweston, Somerton	5	0	0
gby, G. D. W.	Sherborne Castle	2	0	0
ham, John	Exeter	1	0	0
nacombe, James	Huntsham Barton, Tiverton	0	10	0
tin, Henry	Paignton, Torquay	0	10	0
tin, G.	Paignton, Torquay	0	10	0
vett, Edward, M.P.	Bystock, Exeter		. .	
ett, John	Bovey Tracey, Newton Abbot	1	0	0
on, Hugh	Claughton-cum-Grange, Birkenhead	1	0	0
bs, Francis	North Molton	0	10	0
le, Henry	Uffculme, Collumpton	0	10	0
le, Francis	Holcombe Rogus, Wellington	0	10	0

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Name.	Residence.	Sub-scriptions.		
		£.	s.	d.
Doble, John	Buckland St. Mary, Chard	0	10	0
Doble, Richd.	Bartiliver, Probus, Cornwall	0	10	0
Dowding, Charles	Cucklington	0	10	6
Dowding, Edwyn	Vineyards, Bath	1	0	0
Downing, George	Pickwell, Georgeham, Barnstaple	0	10	0
Downing, Joshua	Horwood, Barnstaple	0	10	0
†Drake, Sir T. T. F. E., Bart.	Nutwell Court, Lympstone, Exeter		..	
Dray and Co.	Swan Lane, London, E.C.	2	0	0
Drew, John	Peamore, Exeter	0	10	0
†Drewe, E. S.	The Grange, Honiton		..	
*Duckworth, Sir J. T. B., Bart.	Weir, Exeter	2	0	0
Dunn, Francis	Gogwell, Tiverton	0	10	0
Dunn, J. H.	Gillingham, Wincanton	0	10	0
Dunn, Robert	West of England Wheel-works, Wellington	0	10	0
Dunn, Rev. Robt.	Huntsham, Tiverton	1	0	0
Dunning, Richard	Townsend, Winkleigh, Eggesford	0	10	0
Dunning, William	Friar Wooden, Dorchester	1	0	0
†Duntze, Sir J. L., Bart.	Starcross, Exeter		..	
*Durant, R.	Sharpham, Totnes	5	0	0
Durk, Henry	Shoreditch, Taunton	0	10	0
Dyer, William	Fairfinch, Braunton, Barnstaple	0	10	0
Dymond, Francis W.	Exeter	1	0	0
Dymond, Robert	Bampfylde House, Exeter	1	1	0
Eales, Thos. Whiteway	Dartmouth	0	10	0
Eames, T. P.	Cotley Farm, Chard	0	10	0
Eastment, F. M.	Langport	1	0	0
Easton, Edward	The Grove, Southwark	1	0	0
Easton, W.	Bradford, Taunton	1	0	0
Eaton, John	Twywell Works, Thrapstone	0	10	0
*Ebrington, The Viscount, M.P.	Castle Hill, South Molton	2	2	0
Eddy, John	Kennford, Exeter	0	10	0
Edwards, Charles	Brockley Court, Bristol	1	0	0
Edwards, Joseph	Hutton, Weston-super-Mare	0	10	0
Edwards, John	Holway, Taunton	0	10	0
Edwards, John	Bampton, Devon	1	0	0
Edwards, Rev. Henry	Churchstanton, Honiton	1	0	0
Elliott, Edward	Hollowcombe, Ermebridge	0	10	0
Elliott, Eustace	Marsh, Landulph, Hatt, Plymouth	0	10	0
Elliott, John	Rockbeare, Exeter	1	0	0
Elliott, William	Alphington, Exeter	0	10	0
Ellis, Edward	Alphington, Exeter	0	10	0
Ellis, Henry	Bampton, Devon	1	0	0
*Elton, Sir A. H., Bart.	Clevedon Court	3	3	0
England, Henry White	Kingsbury Episcopi	0	10	0

Name.	Residence.	Subscriptions. £.	s.	d.
nd, John	West Newton Farm, North Petherton	0	10	0
istle, Hugh	Llanbethian, Cowbridge. . . .	1	1	0
ner, R. W., M.D. . .	Bath	1	0	0
nt, Mark	Growing, Collumpton	1	0	0
nt, William	Torquay	0	10	0
nt, William	Duces Green, Wellington, Somerset	. .		
ing, Walter	Nether Stowey, Bridgwater . .	0	10	0
ing, J. K.	Nether Stowey, Bridgwater . .	0	10	0
ner, Mrs. Keith . . .	Torquay	1	1	0
er, John	West Camel, Ilchester	0	10	0
er, William King . . .	Charlton Adam, Somerton . .	0	10	0
son, Alex.	Dartmoor, Tavistock	0	10	0
bee, James	Phœnix Iron Works, Stroud . .	1	0	0
ira, G. A.	Chudleigh, Devon	0	10	0
r, J. M.	Taunton	1	1	0
ey, Francis	Fitzhead, Taunton	0	10	0
gerald, H. T. G. . . .	Maperton House, Wincanton . .	2	0	0
er, George Applin . .	Lewell Farm, Dorchester . . .	0	10	0
es, Henry	Whitchurch, Blandford . . .	0	10	0
es, Robert	Milton Abbas, Blandford . . .	1	0	0
s, John	Up-cerne, Dorchester	0	10	0
, John	Creedy Park, Crediton	0	10	0
, Elias	Newton Abbot	0	10	0
, John S.	Holbeton, Ermebridge	0	10	0
, John, jun.	Branscombe	0	10	0
escue, The Earl . . .	Castle Hill, South Molton. . .	5	0	0
escue, the Hon. George .	Bocconoc, Cornwall	2	0	0
r, George	Exmouth	0	10	0
r, Richard	Castle, Lostwithiel, Cornwall .	1	1	0
acre, Thos. White . .	Durston, Taunton	0	10	0
e, W.	Market Lavington	0	10	0
C. J.	East Butterleigh, Collumpton .	0	10	0
Messrs.	Wellington	1	0	0
ell, Thomas Somerton .	Shepton Mallett	0	10	0
is, Philip	Crediton	0	10	0
lin, Thomas	Pinnicombe, Kenn, Exeter . .	0	10	0
r, William	Kingston, Taunton	1	1	0
, J. H., M.D.	Oakford House, Exeter . . .	1	0	0
, Robert	Bickington, Newton Abbot . .	0	10	0
, William	Coombe Farm, Bradninch, Collumpton	0	10	0
le, William	Dartington, Totnes	1	0	0
Messrs. A. and T. . .	Bristol	2	0	0
John	North-End Farm, Clutton . .	0	10	0
John	Woodgate, Wellington . . .	1	0	0
rd, Baldwin	Great Fulford, Exeter	1	1	0
on, Rev. E.	Dawlish	1	0	0
ll, John	Mells, Frome	0	10	0

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Name.	Residence.	Sub-scriptions.		
		£.	s.	d.
Gadd, Robert	Ivyton Farm, Broomfield	0	10	0
Gapper, William	Duddleston, Taunton	0	10	0
Game, John	Milborne Wick, Sherborne	0	10	0
†Gardiner, J. R.	Duchy of Cornwall Office		..	
*Garratt, John, jun.	Bishop's Court, Exeter	2	2	0
Geare, John, jun.	Exeter	1	1	0
Gee, Thos.	The Castle, Upton-on-Severn	1	0	0
Genge, Richard	Limington, Yeovil	0	10	0
Gibbings, R.	Kennford, Exeter	1	0	0
Gibbs, Chas.	Bishop's Lydeard, Taunton	0	10	0
Gibbs, Samuel	Bath	0	10	0
Gibbs, W. M.	Bishop's Lydeard, Taunton	0	10	0
Gibbs, W. W.	Kittisford	0	10	0
Gibbs, Winter	Taunton	1	1	0
Gilbert, J. P.	National Provincial Bank, Barnstaple	1	0	0
Giles, Joseph	Dunstone, Yealmpton	0	10	0
Giles, Robert	Penquit, Ermebridge	0	10	0
Gill, Thomas	Crescent, Plymouth	1	0	0
Gillard, John	Fawn Hotel, Ermington	0	10	0
Gillett, W. E.	Fairwater House, Taunton	1	1	0
Gillham, George	Southdown, Burlescombe	0	10	0
Gliddon, John	Williton	0	10	0
Gonzales, José del Riego (Attaché to the Peruvian Embassy).	Care of G. Smith, 22, Southampton Street, London	1	0	0
Goodden, John	Compton House, Sherborne	1	0	0
Goodridge, J. Jackson	Paignton, Torquay	0	10	0
Gordon, Chas., jun.	Gittisham, Honiton	1	1	0
Goss, S.	Ham, Alverdiscott	0	10	0
Gould, John	Poltimore, Exeter	1	1	0
Gould, Joseph	New Hall, Broadclyst	0	10	0
Gould, R. H.	20, Cockspur Street, London, S.W.	1	0	0
Graburne, R. S.	Mells, Frome	1	0	0
Graddon, William	Brightley, Chittlehampton	0	10	0
Grant, John	Hutcherleigh, Halwell, Totnes	0	10	0
Grant, Wm. Chas.	Hillersdon House, Collumpton	1	0	0
*Gray, Benjamin	Bath	2	2	0
Gray, Benjamin, Dr. Ph., M.A.	22, Hamilton Terrace, St. John's Wood, London, N.W.	1	1	0
Gray, John	Kingweston, Somerton	1	0	0
Gray, Jonathan	Summer Hill House, Bath	1	1	0
Gregory, Arthur	Montacute, South Petherton	1	0	0
Gregory, John	.. ..	1	0	0
Gregory, R.	Barnstaple	0	10	0
Greening and Co.	Cateaton Street and Church Gates, Manchester	1	0	0
Gregory, Arthur	Montacute, Yeovil	1	0	0
Grendon, William	Larkbere Farm, Tallaton, Ottery	0	10	0
*Grenville, Ralph Neville	Butleigh, Glastonbury	2	0	0
Gribble, William	Barnstaple	0	10	0

Name.	Residence.	Sub-scriptions.		
		£.	s.	d.
a, Benjamin S.	Culm John, Broadclyst	0	10	0
a, John	New House, Rewe	0	10	0
ing, Francis John	Walton Farm, Glastonbury	0	10	0
tt, John	Marpool Farm, Exmouth	0	10	0
lay, J.	Chapel Cleve, Taunton	1	0	0
, James	Colyford, Colyton	0	10	0
, John C.	Molland, Southmolton	0	10	0
Joseph	Budlake, Broadclyst	0	10	0
ing, Henry	Dean Prior, Ashburton	0	10	0
ock, J. D.	Halse, Milverton	0	10	0
y, Edward	Sierford, Cheltenham	0	10	0
am, Josiah	Yeovil	1	0	0
n, G.	Newton House, Yeovil	1	0	0
ng, Rd.	West Cranmore, Shepton Mallet	0	10	0
ng, James	Waterson, Dorchester	0	10	0
ng, Joseph	Marksbury	0	10	0
ng, Rev. G. R.	Gittisham Rectory, Honiton	1	1	0
ng, T. Goldie	Halsannery, Bideford	1	1	0
John	Litfield Place, Clifton	1	0	0
rd, W. H., jun.	Barley Wood, Wrington	1	1	0
s, Chas.	Ilchester	0	10	0
, J.	Bittadon	0	10	0
ley, W. H.	Lye Grove House, Sodbury	2	2	0
y, Wm.	South Petherton	0	10	0
er, Rev. John Manley	Ideford Rectory, Chudleigh	0	10	0
es, Thomas	Tiverton	0	10	0
ins, Charles	Alton Pancras, Dorchester	0	10	0
ins, Robert	Milborn Port, Somerset	0	10	0
on, Robert C.	Chittiscombe Barton, Tiverton	0	10	0
on, Thomas C.	Rixfarm, Tiverton	0	10	0
on, Thomas	Peter Street, Tiverton	0	10	0
ard, Charles	Dartmouth Grange, Dartmouth	0	10	0
ard and Payne	Express Office, Bath	1	0	0
Robert Thomas	Alphington	1	1	0
l, John	Sandford, Crediton	0	10	0
l, Robert	Shepton Mallet	1	0	0
, Thomas	Sunderly, Bampton	0	10	0
, William E.	Gasworks, Honiton	1	0	0
hcoat, John, M.P.	Tiverton	2	2	0
field, T.	Stoodleigh, Tiverton	1	0	0
tch, Josiah	Stratton, South Petherton	0	10	0
d, Robert	Taunton	0	10	0
ning, William	Coldicott, Moreton in the Marsh	0	10	0
r, William	Sevenhampton, Highworth	1	0	0
tt, John	Edgborough Farm, Staplegrove, Taunton	0	10	0
tt, William	Norton Court, Taunton	1	0	0
h, Andrew	Stoodleigh, Tiverton	0	10	0
, James R.	Land Farm, Silverton	0	10	0
itson, W.	Chaldon, Croydon		. .	
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Name.	Residence.	Sub-scriptions.		
		£.	*s.*	*d.*
Hewlett, W. S.	Gosworthy, Newhouse, Ivybridge	0	10	0
Heywood, Joseph	Lake Farm, Abbotsham	0	10	0
Hibberd, Henry	Battle Farm, Reading	0	10	0
Hickes and Isaac, Messrs.	Surveyors, Northgate Street, Bath	0	10	0
Hill, William	Bow, Crediton	0	10	0
Hippisley, E.	Wells, Somerset	1	0	0
*Hippisley, J. H.	Stone Easton, Old Down	3	3	0
Hitchcock, Henry	Chilterne All Saints, Heytesbury	1	0	0
Hitchcock, Thomas	Brendon Hill Farm, Wiveliscombe	0	10	0
Hitchman, W.	Long Ashton, Bristol	0	10	0
*Hoare, P.	Luscombe, Dawlish	2	0	0
Hobbs, William	Kencott, Lechlade	0	10	0
Hobbs, William Fisher	Boxted Lodge, Colchester	1	0	0
*Hobhouse, H.	Hadspen House, Castle Cary	2	0	0
Hoddinott, Simon	Mitchel's Elm Farm, Wanstrove, Frome	0	10	0
*Hodge, Wm. Chapple	Devonport	2	0	0
Hodges, Abraham	South Petherton	0	10	0
Hodinott, John	East Cranmore, Shepton Mallet	0	10	0
Hodgson, Charles	Blagdon, Paignton, Torquay	0	10	0
Hodson, Rev. G. F.	North Petherton	0	10	0
Hogg, Rev. J. R.	Torquay	1	0	0
Hogg, William	Upton Pyne, Exeter	0	10	0
Hole, Jas.	Knowle, Dunster	1	1	0
Hole, John	Corton Denham, Sherborne	0	10	0
Hole, Robert	Harwood House, Dunster	1	0	0
Hole, William	Hannaford, Barnstaple	0	10	0
Hole, W. R.	Park, Bovey Tracey	1	0	0
*Holford, R. S.	Weston Leigh, Tetbury	2	2	0
*Holland, Edward	Dumbleton Hall, Evesham	2	0	0
Holman, Richard	Avalon House, Glastonbury	0	10	6
Holmes, Messrs.	Norwich	2	2	0
Hollway, Messrs.	Bath	0	10	0
Hood, Hon. A. N.	Cumberland Lodge, Windsor	1	0	0
*Hood, Sir A. Acland, Bart.	St. Audries, Bridgwater	10	0	0
Hooper, John	Withecombe, Chagford, Exeter	1	0	0
Hooper, William	Rushford Barton, Chagford	0	10	0
Horlock, Rev. Dr.	Box House, Chippenham	1	1	0
*Horner, Rev. J.	Mells Park, Frome	5	0	0
Hornsby and Son	Grantham, Lincoln	1	0	0
Horsford, John	Salston Barton, Ottery St. Mary	0	10	0
Hosegood, George C.	Huish Barton, Bicknoller	0	10	0
Hoskins, Thos.	Haselbury, Crewkerne	1	0	0
How, W.	Bideford	0	10	0
Howard, James	Alphington	1	0	0
Howard, Messrs. J. & T.	Bedford	1	0	0
Huckvale, Thos.	Choicehill, Chipping Norton	1	0	0
Hughes, James	Manna Mead Villas, Plymouth	1	0	0
Hulbert, Thos.	Pickwick, Chippenham	0	10	0
Hulme, Henry	Brunworthy, Churchstanton	1	0	0
†Hulse, Sir Edward	Breamore, Salisbury		. .	
(50)				

Name.	Residence.	Subscriptions.		
		£.	s.	d.
Humphries, E.	Pershore, Worcester	1	0	0
Hunt, H. Carew	Maisonette, Stoke Gabriel, Totnes	1	0	0
Hunt, Nicholas	Paignton, Torquay	0	10	0
Hunt, Richard	Barnshill, Paignton, Torquay	0	10	0
Hurley, Thomas	Binder Farm, Wellington	0	10	0
Hussey, John Richards	Waybrooke, Exeter	1	0	0
Hussey, Thomas	Waybrooke, Exeter	1	0	0
Hutchings, Samuel	Wenham House, Collumpton	1	1	0
Huxham and Brown	Exeter	1	0	0
Huxham, George	Netton Barton, Revelstoke, Plymouth	0	10	0
Huxtable, Rev. A.	Sutton Blandford	1	0	0
*Huyshe, Rev. John	Clysthydon, Collumpton	5	0	0
Huyshe, Rev. Roland	East Coker, Yeovil	0	10	0
Impey Robert	Street, Glastonbury	0	10	0
Jackson, John, jun.	Yalberton, Paignton, Torquay	0	10	0
James, J. H.	Chichester Place, Exeter	1	1	0
James, Rev. C. T.	Farmers' Club House, 39, New Bridge Street, Blackfriars	0	10	6
James, Isaac	Cheltenham	0	10	0
James, W.	Mapowder, Blandford, Dorset	0	10	0
Jarviss, George	Norton Ferris, Frome	0	10	0
Jenkin, S. W.	Redruth, Cornwall	0	10	0
*Jenner, Capt. Hugh	Wenvoe Castle, Glamorgan	2	0	0
Jenner, Robert Francis	Wenvoe Castle, Cardiff	1	1	0
Jerrard, Henry	Pinney Hill, Lyme, Dorset	0	10	0
Jerrard, Joseph	Chideock, Bridport, Dorset	0	10	0
Jewell, Thomas	Surveyor, Taunton	1	0	0
Johnson, Rev. W. C.	Diptford, Totnes	1	0	0
Joice, John	Allercott, Dunster	0	10	0
Jones, R. Denison	Middleton Court, Huish Campflower, Wiveliscombe	1	0	0
Jones, R. L.	Blagden Lodge, Taunton	1	1	0
Jones, Winslow	Exeter	1	1	0
Keene, Messrs.	*Bath Journal*	0	10	6
†Kekewich, S. T.	Peamore, Exeter		..	
Kellaway, J. W.	Ryde, Isle of Wight	1	0	0
Kellow, Wm. B.	St. Austell	0	10	0
Kelly, John	Filleigh House, Chudleigh	1	0	0
Kemp, John W.	Cudmoor Farm, Bampton	0	10	0
Kennaway, Mark	Exeter	1	1	0
*Kennaway, Sir John, Bart.	Escot, Ottery St. Mary.	2	2	0
King, J. Webb	Ash Martock	1	0	0
*King, R. King Meade	Walford House, Taunton	2	0	0
*King, Richard Meade	Pyrland Hall, Taunton	2	0	0
Kingdon, S.	Lynch, Thorverton	1	0	0
Kingdon, Wm.	Treymills, Thorverton	0	10	0

Name.	Residence.	Sub-scriptions.		
		£.	s.	d.
Kinglake, A.	Weston-super-Mare	1	0	0
Kingsbury, John	Taunton	0	10	0
Knapp, J. T.	Clanfield, Bampton, Oxon	0	10	0
†Knight, F. W.	Simonsbath, South Molton		. .	
Knight, Thomas	Kingston, near Taunton	0	10	0
Knollys, J. E.	Fitzhead Court, Taunton	1	1	0
Knowles, Frederick	Wrington	0	10	0
Knowlman, John	Culmstock, Wellington, Somerset	0	10	0
Knowlman, J. C.	Marwood's Farm, Tiverton	0	10	0
*Knyfton, T. T.	Uphill	2	0	0
*Labouchere, The Right Hon.	Stowey Court, Bridgwater	5	0	0
Lakeman, Edmd. Geo.	Modbury	0	10	0
Lakeman, Thos.	Brixham	0	10	0
Lamacraft, John	Broadclyst	0	10	0
Lambert, R. S.	34, Princes Street, Bristol	1	0	0
Lambshead, William	Rose Mount, Ipplepen, Newton Abbot	0	10	0
Lane, James	White Lion Hotel, Bath	0	10	6
Lang, John	Keaton, Ivybridge	0	10	0
Lane, Robert, jun.	Great Gutton, Shobrooke, Crediton	0	10	0
Langdon, George	Ashford, Barnstaple	1	1	0
Langdon, J. C.	Parrock's Lodge, Chard		. .	
Langdon, James	Newport, Barnstaple	0	10	0
*Langton, W. H. P. Gore, M.P.	Newton Park, Bath	2	2	0
Larey, L.	Bath	0	10	0
Lea, James Peard	Powys Cottage, Sidmouth	2	0	0
Leach, William	Kentisbeare, Collumpton	0	10	0
Lee, Lee J.	Dillington, Ilminster	1	0	0
Lee, Richard	Hill, Coplestone, North Devon	0	10	0
Lethbridge, A. G.	Taunton	1	1	0
Leversedge, John	Taunton	0	10	0
Leversha, William	Court Place, Withycombe, Dunster	0	10	0
Leverton, W.	Woolley, Beaford, Eggesford	0	10	0
Ley, Wm.	Woodlands, Exeter	1	0	0
Lidstone, Roger	George Street, Plymouth	0	10	0
Light, Richard	Hill, Coplestone, North Devon	0	10	0
Lock, George	Barton, Instow	0	10	0
Lock, Thos. Langford	Baghay Farm, Milverton	0	10	0
Lock, Thomas	Instow, Barnstaple	1	1	0
Lopes, Ralph	Tetton House, Taunton	1	0	0
*Lopes, Sir M., M.P.	Maristowe, Plymouth	3	0	0
Louch, John	Stanchester House, Langport	1	0	0
Loye, Philip	Stokenham, Kingsbridge	0	10	0
Lucas, William	East Coker, Yeovil	0	10	0
Lush, Benjamin Samuel	Kilmington, Frome	0	10	0
Lush, Joseph	Bromham House, Bruton	1	0	0
Lutley, John	Parsonage, Wiveliscombe	0	10	0
Luttrell, G. F.	Woodland House, Bridgwater	1	0	0
Luttrell, Lieut.-Col. F. C.	Kilve, Bridgwater	1	0	0
Luttrell, A. F.	Quantoxhead, Bridgwater	1	1	0

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Name.	Residence.	Sub-scriptions.		
		£.	s.	d.
Luttrell, Rev. A. H. F.	Minehead, Bridgwater	1	0	0
Luxmoore, Rev. J. R.	Hatherleigh	1	1	0
Mackenzie, D.	Prince Town, Dartmoor	0	10	0
Mackenzie, J. H.	Teignmouth	1	1	0
Madge, John	Gittisham, Honiton	0	10	0
Maggs, Oliver	Bourton Foundry, Wincanton	1	0	0
Manley, Wm.	Westwood, Broadclyst	0	10	0
Manning, H.	South Molton	0	10	0
Marden, William	Pen Mill, Yeovil	0	10	0
Marker, Rev. G. T.	Uffculme, Collumpton	1	0	0
Marks, John	Droridge, Dartington, Totnes	0	10	0
Marsh, Rev. G.	Sutton Benger, Chippenham		. .	
Marshall, John	Belmont, Taunton	1	1	0
Martin, James	Tye Farm, Collumpton	0	10	0
Martin, Thomas	Coomberoy, Broadclyst	0	10	0
Marychurch and Sons	Haverfordwest	1	1	0
Mason, Charles G.	Beenleigh, Totnes	0	10	0
Mathen, J. P.	Hemyork, Wellington, Somerset	0	10	0
Matthew, J.	Clysthydon, Collumpton	0	10	0
Matthew, Jonah	Rydon House, Tallaton, Ottery	1	0	0
Matthews, Charles	Bradninch, Collumpton	0	10	0
Matthews, Harry	Wiveliscombe	0	10	0
Matthews, William Edwin	Gnaton Hall, Yealmpton	1	0	0
Matthews and Duke	Dunball Works, Bridgwater	1	0	0
May, Frederick	*Courier Office*, Taunton	1	1	0
May, George	Sheepham, Modbury, Ivybridge	0	10	0
May, R.	Rewe, Exeter	1	0	0
Maynard, R.	Taunton	0	10	0
Meetens, George	London Hotel, Taunton	1	0	0
Melhuish, J.	Chemist, Taunton	0	10	0
Merriman, J.	Ashford House, Bridgwater	0	10	0
Merry, Richard	Goulds, Broadclyst	0	10	0
Merson, James	Brinsworthy, North Molton	0	10	0
Merson, Thomas	Tiverton	1	0	0
Messiter, Thomas	Barwick House, Yeovil	1	0	0
Meyler, C. G.	*Bath Herald*, Bath	0	10	0
Michell, Rev. B.	Winsford, Dulverton	1	0	0
Michelmore, Thomas	Berry House, Totnes	1	1	0
Michelmore, Thomas, jun.	Berry, Totnes	1	1	0
Middleton, J. F.	Kingston, Taunton	0	10	0
Miles, G. F. W.	Ford Abbey, Chard	1	1	0
†Miles, John William	Kingsweston, Bristol		. .	
Miles, Thomas Binns	Langford Court Farm, near Bristol	1	0	0
Miles, William	Dix's Field, Exeter	1	1	0
*Miles, Wm., M.P.	Leigh Court	5	0	0
Milford, Frederick	Exeter	1	1	0
Milford, George	Thorverton, Cullompton	0	10	0
Milford, John	Exeter	1	1	0
Milford, Thomas	Thorverton, Cullompton	0	10	0
Milford, Thomas, jun.	Thorverton, Cullompton	0	10	0
(50)				

Name.	Residence.	Sub-scriptions.		
		£.	s.	d.
Millard, William	Leighton, Frome	0	10	0
Miller, Thomas	Castle Farm, Sherborne	0	10	0
†Miller, Dr.	Exeter		..	
Mills, James	Limington, Ilchester	0	10	0
Milton, John	The Park, Wiveliscombe	0	10	0
Milward, John	Newton Abbott, Devon	0	10	0
Mitchell, Thomas	Pinhoe, Exeter	1	0	0
Mitchell, William	Penquit Lodge, Ermebridge	1	0	0
Mock, Edward	Braunton, Barnstaple	0	10	0
Mockeridge, John	Greenway, Taunton	0	10	0
Mogg, Carey Bailey	Bridgwater	1	1	0
Mogg, John Rees	High Littleton	1	1	0
Mogg, Samuel	Hyde Farm, West Monckton	0	10	0
Monday, James	West Manley, Tiverton	0	10	0
Monday, Wm.	Runnington Farm, Wellington	0	10	0
*Moody, C. A., M.P.	Kingsdon, Taunton	5	0	0
Moon, James	High Street, Barnstaple	0	10	0
Moore, H. T.	Houndstone, Yeovil	1	0	0
Moore, John	Littlecott, Pewsey	1	0	0
Moore, William	Hanley Castle, Upton-on-Severn	1	0	0
*Morgan, Sir Charles, Bart.	Tredegar Park, Newport	2	2	0
Morle, Thomas B.	Cannington Park Farm, Bridgwater	0	10	0
†Morley, Earl of	Saltram, Plymouth		..	
Morse, Dennis	Uplowman, Tiverton	0	10	0
Moysey, H. G.	Bathealton Court, Wellington, Somerset	1	0	0
Mudge, William	Ford Farm, Newton Abbott	0	10	0
Murch, Clement	Sutton Barton, Collumpton	0	10	0
Murch, E.	Bridgwater	0	10	6
*Murch, J.	Cranwell, Bath	2	0	0
Musgrave, J.	Emmerfield, Washfield, Tiverton	0	10	6
Myers, Jaques	Torquay	1	1	0
Naish, W. B.	Stone Easton	1	1	0
Nalder, J. H.	Alvescote, Lechlade	0	10	0
Nell, William	Cardiff	1	1	0
New, John	Craddock, Collumpton	1	1	0
Newberry, Giles	The Priory, Collumpton	0	10	0
Newberry, Thomas	Axmouth	0	10	0
Newbery, Samuel	Southleigh, Honiton	0	10	0
Newman, Joseph	West Lydford, Somerton	0	10	0
Newman, Rev. W. James	Hockworthy, Wellington	1	0	0
*Newman, Thomas	Mamhead, Exeter	5	0	0
Newport, Theodore	St. Germans, Devonport	1	0	0
Newton, F. W.	Barton Grange, Taunton	1	0	0
†Newton, J. G.	Millaton House, Okehampton		..	
Newton, John	Fitzhead, Taunton	0	10	0
Nicholetts, J. T.	South Petherton	1	0	0
Norman, George	Bath	1	1	0
Norrington, Charles, and Co.	Commercial Wharf, Plymouth	0	10	0

Name.	Residence.	Sub-scriptions.		
		£.	s.	d.
gton, Henry	Bartholomew Terrace, Exeter	0	10	0
, John	Huxham, Bradninch	0	10	0
, Josh.	Kennicott, Broadclyst	0	10	0
, Wm.	Loxbeer Barton, Tiverton	0	10	0
ote, Edw. Chas.	Barnstaple	1	0	0
ote, George Barons	Somerset Court, South Brent	1	0	0
ote, Rev. H. Mowbray	Monkokehampton, Eggesford	0	10	0
cote, Sir S. H., Bart.	Pynes, Exeter	5	0	0
ey, Wm.	Lake Farm, Lifton, Launceston	0	10	0
rthy, William	Ford, Manaton, Moretonhampstead	0	10	0
mbe, John	Hopcott, Minehead	0	10	0
, Wm.	Taunton	0	10	0
y, John	Old Cleeve, Dunster	0	10	0
y, Thomas	Dunster	0	10	0
y, William	Oak Trow	0	10	0
herty, Richard	Landrake, St. Germain's	0	10	0
, Edmund	Ratfin, Amesbury	0	10	0
ve, Lewis J.	Bridgetown, Totnes	1	0	0
, John	Manor House, Middlezoy	1	0	0
Thomas	Trescow, Bodmin	0	10	0
ne, James	Doulton Farm, Shepton Mallet	0	10	0
am, W.	Pipshayne Farm, Bampton	0	10	0
Capt. Robert	56, Pulteney Street, Bath	1	0	0
Thomas	Laverstock Hall, Salisbury	1	0	0
Sir L. V., Bart.	Haldon House, Exeter		. .	
r, Henry	Fairfield, Collumpton	0	10	0
r, John	Court Barton, Newton St. Cyres	1	0	0
r, Walter	Long Sutton, Langport	0	10	0
r, Robert	Ditto ditto	0	10	0
ore, Matthew	Talbot's Town, Brittas, County Dublin	0	10	0
ore, Robert	Hindon, Minehead	0	10	0
, Arthur S.	Exeter	0	10	0
, George	Mells, Frome	0	10	0
, Henry	Burnett, near Bath	0	10	0
, Samuel	Havyatt's Green, Langford	0	10	0
l, William	Bowden, Yealmpton	0	10	0
s, George	Martock, Somerset	0	10	0
s, Henry	Haselbury, Crewkerne	0	10	0
s, James	Langport	1	0	0
s, Thomas	Bridgwater	1	1	0
s, William	Charlton, Horethorn	0	10	0
s, W. L.	Midsomer Norton	1	1	0
dge, John	Bow, Crediton	1	0	0
dge, S.	Sandford, Crediton	0	10	0
dge, William	West Anstey, Dulverton	0	10	0
re and Savery	Exeter	1	0	0

Name.	Residence.	Subscriptions.		
		£.	s.	d.
Passmore, John	Aller, Bishop's Nympton, South Molton	0	10	0
Patch, Frederick Owen	Broomfield, Tiverton	1	1	0
Patton, Thomas	Bishop's Hull, Taunton	1	0	0
Peek, Wm.	Luccombe, Minehead	0	10	0
Pearce, Alfred John	Chantrey, Aveton, Gifford, Ivybridge	1	0	0
Pearse, John	Littleham, Exmouth	0	10	0
*Pearse, Robt. Chas. Thos.	Southwarnborough Lodge, Odiham, Hants	2	0	0
Pearse, Samuel	Exeter	1	0	0
Pearse, Thomas	Uplowman Court, Tiverton	0	10	0
Pedlar, J. Quick, jun.	Wellington, Somerset	0	10	0
Pennell, R. L., M.D.	Venn Bridge House, Dunsford	1	1	0
Penny, William	Kingsbury Episcopi, Langport	0	10	0
Perian, John Trowey	Bampton	0	10	0
Perry, Robert	New Farm, Priston	0	10	0
Perry, William	Cholstrey, Leominster	0	10	0
Perryman, Thomas	Easter Ackland, Landkey, Barnstaple	0	10	0
Pethebridge, Richd.	Pill, Barnstaple	0	10	0
Pethebridge, William	Tutshill, Pilton, Barnstaple	0	10	0
Phillips, J. H.	Anstey, Dorchester	0	10	0
*Pickwick, Major W.	Bathford, Bath	2	2	0
Pidsley, R. H.	Moor Farm, Sowton, Exeter	1	0	0
Pigot, Lady	Chippenham Park, Soham	1	0	0
Pine, J.	Combe Land, Tiverton		. .	
†Pinney, W., M.P.	Somerton		. .	
Piper, John	Strete Ralegh Farm, Whimple	1	0	0
†Pitman, Samuel	Rumwell Lodge, Taunton		. .	
Pitman, J. S.	Dunchideock, Exeter	1	1	0
Pitman, Rev. W.	Aveton Gifford, Kingsbridge	1	0	0
Pitt, Robert, jun.	Cullompton	0	10	0
Pitts, Edwin	Drewsteignton, Exeter	1	0	0
Pitts, Frederick	Matford Farm, Alphington	0	10	0
Pitts, James Pitt	Newton, Drewsteignton, Exeter	0	10	0
Pitts, Nicholas	South Allington, Kingsbridge	0	10	0
Pitts, Richard	Kenn, Exeter	0	10	0
Player, Jos.	Ball's Farm, Silverton, Cullompton	0	10	0
Plucknett, Rev. C.	Holton, Wincanton	1	0	0
Pollard, George	High Street, Taunton	0	10	0
Pollard, Richard	Blagdon Paignton, Torquay	0	10	0
Polyblank, John	Newton Abbott	0	10	0
Ponsford, Rev. W.	Drewsteignton	1	1	0
Pontey, Alexander	Nurseries, Plymouth	1	0	0
Ponting, T.	Whatley, Frome	0	10	0
Pool, Joseph	Coate, Martock	0	10	0
Poole, James, jun.	Whitchurch, Somerset	0	10	0
Poole, Gabriel Stone	Bridgwater	1	0	0
Poole, Richard	Bathealton, Wellington	0	10	0
Pope, Edward	Great Toller, Dorchester	0	10	0

Name.	Residence.	Subscriptions.		
		£.	s.	d.
Thomas	Horningsham, Warminster	0	10	0
, W. J. P.	Symondsbury, Bridport		. .	
er, W.	Hembury Fort, Honiton	2	0	0
man, Lord.	Bryanston, Blandford	5	0	0
man, Hon. W. B.	Bryanston, Blandford	2	0	0
r, Thomas	Yellowford, Thorverton, Cullompton	1	0	0
lett, Lord William	Bathwick	2	0	0
, J. D.	Sprattshayes, Exmouth	0	10	6
, John	Tallaton Farm, Tallaton, Ottery.	0	10	0
, Richard	Broad Oak, Clysthydon, Collumpton	0	10	0
on, William Scott	Leigh, Chulmleigh	1	0	0
aux, Sir E. S., Bart.	Netherton Hall, Honiton	1	1	0
am, W.	Montacute, Yeovil	0	10	0
ore, Abraham	Syston, Leicester	0	10	0
r, Edward	48, York Terrace, Regent's Park, London, N.W.	2	0	0
or, T. and H.	Cathay, Bristol	1	1	0
r, Edward	40, New Bridge Street, London, E.C.	1	1	0
, Charles H.	Combe Hay, Bath	0	10	0
George	Ipswich, Suffolk	1	0	0
, Capt. John	Ford House, Bideford	1	0	0
Samuel	Lower-house, Payhembury, Ottery St. Mary	0	10	0
, Rev. W.	West Charlton, Somerton	1	1	0
ly, James	Molland, South Molton	1	0	0
et, Edward	Langport	1	1	0
iffe, John	Beer Farm, Broadclyst	0	10	0
iffe, Rev. W.	Warleigh, Plymouth	1	1	0
all, W.	Plymouth	0	10	0
ore, George	Thorverton, Cullompton	1	0	0
ore, G.	Easton, Thorverton, Cullompton.	0	10	0
ore, G.	Upcott Farm, Thorverton	1	0	0
ore, G., Junr.	Upcott, Thorverton, Cullompton	1	0	0
ore, John	Upcott, Thorverton, Cullompton.	0	10	0
olph, James	Milverton	1	0	0
omes and Sims	Ipswich	2	0	0
ence, James	Bulbridge, Wilton, Salisbury	0	10	0
ison, ——	Batheaston	1	1	0
es, Michael	Mells, Frome	1	0	0
Clare Sewell	Barton Hall, Brandon	0	10	0
ood, Geo.	Bathealton, Wellington.	0	10	0
l, J. Haythorne	Burnham		. .	
es, Robert and John	Bratton, Westbury, Wilts	0	10	0
ell, John	Coffinswell, Newton Abbot	0	10	0
ell, Thos. L. T.	Tiverton	1	0	0

Name.	Residence.	Subscriptions.		
		£.	s.	d.
Rendell, Walter	Buckland Barton, Coombinteignhead, Teignmouth	0	10	0
Rendle, S. S.	Churston, Churston Ferrers	0	10	0
Rendle, W. E. (Seed Merchant)	Plymouth	1	0	0
Richards, Thomas	Wincanton, Somerset	0	10	0
*Riccard, J. E. J.	South Molton	2	2	0
Richards, Francis Trood	Netherexe, Exeter	0	10	0
Richards, W. H.	Stapleton, Martock	1	1	0
Richmond and Chandler	Salford, Manchester	0	10	0
Ridgway, A.	Blackauton, Totnes	1	0	0
Risden, Thos. Hawkes	Washford, Tiverton	0	10	0
Risdon, John, jun.	Manor Farm, Fitzhead, Taunton	0	10	0
*Robartes, Thos. J. Agar	Lanhydroc, Bodmin	2	0	0
Roberts, John	Mulorn, St. Austell	0	10	0
Roberts, William	Exeter	1	0	0
Rock, Philip	Gratton, High Bray, Barnstaple	0	10	0
Rodbard, John R.	Aldwick Court, Langford	1	1	0
†Roe, C.	Lynemouth		. .	
Rogers, Dr.	Honiton	0	10	6
Rogers, Francis	Hillhay, Fowey, Cornwall	0	10	0
Rogers, Sir F., Bart.	Blachford, Ivybridge	1	0	0
Rossiter, Samuel	Paignton, Torquay	0	10	0
Rowcliffe, C.	Stogumber, Taunton	1	0	0
Row, W. N.	Cove, Tiverton	1	1	0
Rowde, Francis	Ekey, Lostwithiel, Cornwall	1	0	0
Rowe, Wm. Wevill	Longbrook, Milton Abbot, Tavistock	0	10	0
Rowley, T. S.	Rowthorne, Chesterfield	0	10	0
Rowsell, Charles	Langford Budville, Wellington	0	10	0
Rowsell, Samuel	Buckland St. Mary, Chard	0	10	0
Ruck, Edmund	Castle Hill, Cricklade	0	10	0
†Russell, Right Hon. Lord J.			. .	
Rutter, John	Saltford, Bath.	1	0	0
Sadler, W. J.	Bentham, Purton, Swindon	0	10	0
*Saint Germans, Earl of	Port Eliot, Devonport	5	0	0
Salisbury, Edwd.	Venman's Farm, Bampton	0	10	0
Salter, Charles	Newlands, Broadclyst	0	10	0
Salter, George	Combe Farm, Crewkerne	1	0	0
Salter, John	Broomhill, Broadclyst	0	10	0
Salter, John	Peverston, Collumpton	0	10	0
Salter, William	Broadclyst	0	10	0
Sampson, John	Brympton, Yeovil	0	10	0
Sanders, E. A.	Stoke Hill, Exeter	1	0	0
Sanders, James	Comberoy, Broadclyst	0	10	0
Sanders, Thos. Coulson	Exeter	1	1	0
Sandrey, W.	Budehaven, Stratton, Cornwall	0	10	0
*Sanford, Edwd. Ashford	Nynehead Court, Wellington	3	0	0
Saunders, Edward	Town Mills, Bath	0	10	0
Saunders, T. T. H.	Chudleigh		. .	
Savery, John Thomas	Modbury, Plymouth	1	0	0

Name.	Residence.	Sub-scriptions.		
		£.	s.	d.
bell, G. T., Capt. R.N.	Kingwell, Bath	2	0	0
, Thomas	5, Charing Cross, London, S.W.	1	0	0
amore, James	Helwill, Kenton, Exeter	0	10	0
, H. N.	Castle Hill House, Nether Stowey	1	1	0
an, Henry	Gerston, Totnes	1	0	0
on, S. T.	Bluehayes House, Broadclyst	1	0	0
mour, Rev. Sir J. H. C., rt.	Northchurch, Birkhampstead		. .	
our, H. D., M.P.	39, Upper Grosvenor Street, London, W.	1	0	0
land, Frederick	Wellington, Somerset	1	1	0
pe, Robert	Hewelsford Court, Coleford	1	1	0
herd, Thomas	Kingsbury Episcopi	0	10	0
s, John	Kennford, Clyst St. George, Exeter	0	10	0
e, Robert	2, Baring Crescent, Exeter	1	0	0
e, Henry	Cary Fitzpaine, Somerton	1	0	0
fin, Thomas	Yms-du, Lantrissant, Glamorgan	0	10	0
nouth, Lord Viscount	Up-Ottery, Devon	2	2	0
fant, John	Coombe, Copplestone, North Devon		. .	
, Sir John	Munty Court, Taunton	1	1	0
h, Albert	Tamar Terrace, Stoke, Devonport	1	1	0
h, Bartholomew	Timsbury	1	0	0
h, F. A.	Escott Cottage, Ottery St. Mary	0	10	0
h, Francis	Chemist, Argyle Street, Bath	0	10	0
n, Henry Trefusis	Morrice Square, Devonport	1	0	0
h, Robert	Emmett's Grange, South Molton	1	0	0
n, W.	Bibury, near Fairford	1	0	0
n, William	Kettering, Northampton	1	1	0
h, F.	Westland Pound, Kentisbury	0	10	0
, Benjamin	Wayton, Hatt, Plymouth	0	10	0
, John	Sand Barton, Sidbury, Sidmouth	0	10	0
, John	Braunton, Barnstaple	1	1	0
, Thomas	Franklyn, Exeter	1	1	0
erville, James Curtis	Dinder House, Wells		. .	
by, Rev. T. H.	Milverton	1	0	0
eron, T. H. S. B. E., M.P.	Estcourt, Tetbury	2	0	0
combe, William	Aylscot, Westdown, Barnstaple	0	10	0
s, W.	Crewkerne	1	0	0
ow, John Wakeham	Lipson Terrace, Plymouth	0	10	0
er, J. P.	Oakhill, Bath	1	0	0
er, Michael	West Abertraw, Cowbridge	0	10	0
er, Walter	Little Chalfield, Chippenham	0	10	0
ler, Edward	Manna Mead, Plymouth	0	10	0
r, Robert	Branscombe, Sidmouth	0	10	0
r, J.	Honiton	0	10	0
er, Gerard	Cotford, Wiveliscombe	0	10	0
er and Bayley	Southampton	0	10	0
way, Rev. Edward	Heathfield, Taunton	1	0	0
way, Captain F.	2nd Somerset Militia, Spring Grove Park, Milverton	1	1	0
way, John	Spring Grove Park, Milverton	1	1	0

Name.	Residence.	Subscriptions.		
		£.	s.	d.
Spurway, John P.	Spring Grove Park, Milverton	1	1	0
Stanbury, J.	Woolacombe, Morthoe	0	10	0
Stanfield, J. E.	Crewkerne	0	10	0
Staples, Joseph	Stoke-under-Ham, Yeovil	0	10	0
Stark, John C.	Torquay	1	0	0
*Starkey, J. B.	Spye Park, Chippenham	2	0	0
Stark, Benjamin	Burrow Hill, Kingsbury, South Petherton	0	10	0
Steer, ——	Culmstock, Wellington, Somerset	0	10	0
Stephens, J.	Wilton, Taunton	1	0	0
†Stevens, Rev. Archdeacon	Otterton, Sidmouth		. .	
Stoate, James	Minehead	1	0	0
Stone, John S.	Newport, Monmouth	1	0	0
Stone, Rev. D. S.	Walkhampton, Tavistock	1	0	0
Stone, William	Clayford Farm, Dulverton	0	10	6
Strangways, H. B.	Shapwick, Glastonbury	1	0	0
Stratton, Richard	Broad Hinton, Swindon	1	0	0
Strong, Thomas	Dunchideock, Exeter	0	10	0
Stuckey, William	Kingsbury Episcopi	1	0	0
Studdy, Henry	Waddeton Court, Totnes	1	0	0
Sturge, William	Bristol	1	1	0
Sutton, John, and Sons, Seedsmen	Reading	1	1	0
Symes, John	Coombe, Sherborne	0	10	0
Talley, Wm.	Tiverton		. .	
Talley, Thos. B.	Prescott House, Tiverton	0	10	0
Tamlyn, Wm.	Luccombe, Porlock	0	10	0
Tanner, Henry	The Lodge, Puddington, Crediton	1	0	0
Tapp, Philip	Nettlecombe, Taunton	0	10	0
Tayleur, W. H.	Hampton House, St. Mary Church, Torquay	1	0	0
Taylor, John Marchant	Willing, Ashburton	0	10	0
Taylor, Robert	Ashclyst Farm, Broadclyst	0	10	0
Templeman, Robert	North Perrott, Crewkerne	1	0	0
Templer, Jas. G. T.	Lindridge, Newton Abbott	1	0	0
Terrell, J. H.	Exeter	1	1	0
Thomas, James	Lidlington Park, Bedfordshire	1	0	0
Thomas, J. S.	Wellington House, Clevedon	1	1	0
Thomas and Haywood	Wellington	0	10	0
Thompson, John	Badminton	1	1	0
Thompson, William	Bath	1	0	0
Thompson, William	Maristowe, Plymouth	1	0	0
Thorne, George	Indicombe, West Buckland	0	10	0
Thornycroft, Rev. J.	Thornycroft Hall, Congleton	1	0	0
Thring, J. Gale	Alford, Castle Cary	1	0	0
*Throckmorton, Sir R., Bart.	Buckland, Farringdon	2	0	0
*Thynne, Rev. Lord John	Hawes Farm, Bedford	2	2	0
*Tite, William M. P.	42, Lowndes Square, London, S.W.	2	2	0
Tombs, John King	Langford, Lechlade	0	10	0
Tomkins, Thomas	Piddletrenthide, Dorchester	0	10	0

Name.	Residence.	Sub-scriptions. £.	s.	d.
P. M.	Coyton, Ermington	0	10	0
d, Henry	Sherwood Farm, Feniton, Honiton	0	10	0
John	Mells, Frome	0	10	0
Thomas	Paignton, Torquay	0	10	0
ne, George M.	St. Hilary, Glamorganshire	1	0	0
, John	Montacute, South Petherton	0	10	0
mas, Monsr.	Farmers' Club House, London	1	0	0
wny, Charles	Plymouth	1	1	0
yn, James	Trevarton, Newlyn	0	10	0
yn, John	Trerice, Newlyn East	0	10	0
hard, Hugh	Chaffeigh, Chard	0	10	0
hard, H. C.	Taunton	1	1	0
wna, S.	Lamellyn, Probus, Cornwall	0	10	0
ewy, Henry	Grampound	0	10	0
elyan, Sir W. C.	Nettlecombe Court	2	0	0
W.	South Molton	0	10	0
, E., jun.	Matford, Exeter	1	0	0
, Francis	Netherexe	1	0	0
, Robert	Matford, Exeter	0	10	0
tt, James	Stockleigh, Devon	0	10	0
r, Abraham	Staplegrove, Taunton	1	0	0
r, C. J.	Staplegrove, Taunton	1	1	0
r, G.	Barton, Exeter	1	0	0
r, G., jun.	Combe, Sydenham, Taunton	0	10	0
r, J.	Bidwell, Thorverton	0	10	0
r, Philip Henry	Shapwick, Glastonbury	1	0	0
r, W. Bickford	Fenleigh, Westbury, Wilts	1	0	0
rd and Sons	Boston, Lincoln	2	2	0
ly, Wm. Mansell	Truro	1	0	0
, W.	Halberton, Tiverton	0	10	0
e, John, jun.	Merthen, Falmouth	1	0	0
ll, Edward	Loventor, Totnes	1	1	0
ell, John	Exeter	2	2	0
mare, T. B.	Langport	1	0	0
W.	Eddington, Bridgwater	1	0	0
han, John	Bath	0	10	0
n and Son	Exeter	1	0	0
, John	Whimple, Exeter	0	10	0
Robert	Northcott, Uffculm, Collumpton	0	10	0
t, James	Chilliswood, Taunton	1	0	0
, E. U.	Cornborough, Bideford	1	0	0
g, Richard	Yeovil	0	10	0
n, E.	Torquay	1	0	0
n, G.	Manor House, Claverton, Bath	1	0	0
r, Thomas	Merafield, Plympton St. Mary	0	10	0
s, Rev. T. A.	Ashill, Taunton	1	0	0
orn, Charles	Railway Hotel, Taunton	1	1	0
wright, Charles R.	Shepton Mallet	1	0	0
)				

Name.	Residence.	Sub-scriptions.		
		£.	*s.*	*d.*
*Wait, W. S.	Woodborough, Bath	2	0	0
Wakeham, E. Bowden	Alston, Slapton, Dartmouth	0	10	0
Walker, ——	Marpool, Exmouth	1	1	0
Walkey, J. E. C.	Exeter	1	0	0
*Wall, Rev. F. S.	Bradley House, Newton Abbott	2	0	0
Walrond, J. W.	Bradfield, Collumpton	1	0	0
Ward, Robert	Railway Station, Exeter	1	1	0
†Warner, Thomas	Sussex Square, Brighton	..		
Warren, Robert	Gosford, Ottery St. Mary	0	10	0
Warren, S. H.	Dulverton, Tiverton	1	0	0
Warry, George	Shapwick, Glastonbury	1	0	0
Warry, Thomas	Martock	1	0	0
Watson, Richard H.	Dorsley, Totnes	0	10	0
Watts, George	Claverton Manor Farm, Bath	0	10	0
Watts, William	Littlewood Farm, Frampton, Dorchester	0	10	0
Webb, Thomas	Wrington, near Bristol	1	0	0
Webber, Bernard James	Newton Abbot	0	10	0
Webber, Charles	Winsland, Totnes	1	1	0
Webber, James	Torquay	0	10	0
Webber, John	West Bagborough, Taunton	0	10	0
Webber, Stephen	Stockley Pomeroy, Crediton	1	0	0
Webber, Thomas	Halberton Court, Tiverton	1	0	0
Webster, William Bullock	Great Malvern, Worcester	0	10	0
Weedon, R. B.	Milverton Court, Somerset	1	1	0
*Welman, C. Noel	Norton Manor, Taunton	2	2	0
Wescott, J.	Thorverton	0	10	0
Westcott, W.	Water Slade, Clyst-Honiton	0	10	0
Wheler, Sir Trevor, Bart.	Cross House, Torrington	1	0	0
White, John	Greendale Barton, Woodbury, Exeter	0	10	0
White, Robert	Mells, Frome	0	10	0
White, William	Orwey Porch, Kentisbeare, Devon	0	10	0
White, William	Upcott, Wellington	0	10	0
White, William	Perse Caundle, Milborne Port	0	10	0
White, William	Highwood Farm, Huntsham, Bampton	0	10	0
Whitehead, Arthur	Weston-super-Mare	0	10	0
Whiteway, Richard	Marldon, Totnes	1	0	0
Whittaker, Joshua	Bratton, Salisbury	1	0	0
Whittuck, J. W.	Bath	1	0	0
Whitley, Nicholas	Truro	0	10	0
Widdicombe, John	Torrhill, Ivybridge	1	0	0
Widdicombe, Samuel	Hay, Ivybridge	0	10	0
Widdicombe, William	Collaton, Paignton, Torquay	0	10	0
Wightman and Dunning	Chard	2	0	0
Wilcocks, William	Pengelly, Exeter	0	10	0
Willcock, Ambrose	Buckland Monachorum, Tavistock	0	10	0
Willesford, Rev. F. T. B.	Awliscombe Vicarage, Honiton	1	0	0
Williams, Charles	Norden, Kingsbridge	1	0	0
*Williams, Charles Crofts	Roath Court, Cardiff	3	3	0

Name.	Residence.	Sub-scriptions. £.	s.	d.
ams, Charles Frederick	Tregullow, Cornwall	1	1	0
iams, ——	Braunton	5	0	0
ams, P. H.	Catwell, Williton, Taunton	0	10	0
iams, Robert	Bridehead, Dorchester		. .	
, George	Whilmston Barton, Colebrook, Crediton	0	10	0
, Thomas	Eastwrey, Lustleigh, Newton Abbot	1	0	0
n, Wm. Ernest	Marldon, Torquay	0	10	0
shire, John	Shockerwick House, Bath	2	0	0
ell, John	Kennford, Exeter	1	0	0
ell, William	Rudway, Thorverton, Cullompton	1	1	0
, Brothers	*Gazette Office*, Bath	1	0	0
, John	Martock	1	0	0
, Vincent Stuckey	Langport	1	0	0
, W. S.	Fifehead House, Wincanton	1	1	0
s, James	Stowmarket and Bury St. Edmonds	1	0	0
, John Francis	Worth, Tiverton	1	1	0
ngham, Sergeant	The Rocks, Bath	2	2	0
, Rev. J.	Stoberry Park, Wells, Somerset	1	1	0
, Sir Bourchier P., Bart.	Tawstock Court, Barnstaple	1	1	0
t, J. and R.	Sandford, Crediton	0	10	0
t, Thomas P.	The Island, Tiverton	1	0	0
, Henry	Bigbury Court, Modbury	0	10	0
, John	Holwell Coombe, Modbury	0	10	0
ley, James	Dorchester	0	10	0
an, Rev. H. F.	Stockhouse, Dorset	1	1	0
V. A.	Fremington, Barnstaple	1	0	0
an, Richard	Deane, Shepton Mallet	0	10	0
, John Dennis	Barnstaple	0	10	0
)				

Corresponding Members.

THE WISCONSIN AGRICULTURAL SOCIETY.

Donations

RECEIVED BY THE SOCIETY SINCE ITS EXTENSION.

Name.	Residence.	Date.	Amount.		
			£.	s.	d.
Acland, Sir P. P. F. P., Bart.	Fairfield, Bridgwater	1852	10	0	0
,, ,,	,, ,,	1853	10	0	0
Acland, Sir T. D., Bart.	Killerton, Exeter	1853	10	0	0
Adair, Desmond	Heatherton, Taunton	1852	5	0	0
Adair, Alexander	Heatherton, Taunton	1853	5	0	0
Addington, Hon. W. W.	Up Ottery	1853	2	2	0
Arnold, G., jun.	Dolton, Crediton	1854	2	0	0
Ashburton, Lord	The Grange, Hants	1854	10	0	0
Baker, Rev. R.	Compton Martin	. .	1	1	0
Bedford, Duke of	Endsleigh	1852	21	0	0
Bouverie, Hon. P. P.	Brymore, Bridgwater	1853	5	5	0
Brettle, Alfred	Combe Hay, Bath	1855	1	0	0
Brunel, I. K.	Westminster	1852	5	0	0
Bryde, John Mac	Plymouth	1853	0	10	0
Burnard, Charles F.	Plymouth	. .	0	5	0
Busby, Wm.	Newton, near Bedale	1852	1	0	0
,, ,,	,, ,,	1853	5	0	0
Carrow, J. M. (deceased)	Stoberry, Wells	1852	1	0	0
Clark, J. A.	Street, Glastonbury	1854	2	4	0
Clayton and Co.	Lincoln	1853	2	0	0
Cornes, James	Barbridge, Nantwich	1853	5	0	0
Corner, R.	Torweston, Taunton	1853	0	10	0
Cornish, R. S.	Mayor of Exeter	1853	1	1	0
Coryton, A.	Pentillie Castle, Plymouth	1853	5	0	0
Divett, Edward	Bystock, Exeter	1852	10	0	0
Drake, Rev. —	Stourton Rectory	1853	1	0	0
,, ,,	,, ,,	1854	1	0	0
,, ,,	,, ,,	1855	1	0	0
Durant, R.	Sharpham, Totnes	1852	5	0	0
,, ,,	,, ,,	1853	5	0	0
Ebrington, Lord Visc.	Castle Hill, South Molton	1853	5	0	0
Fox, Brothers	Tonedale, Wellington	1855	5	0	0
Friend, A, per J. W. King, Esq.	. .	1854	1	0	0
Gordon, C., jun.	Gittisham, Honiton	1855	1	0	0
Hensman and Son	Castleworks, Woburn	1852	1	0	0
Hood, Sir A. A., Bart.	St. Audries	1852	10	0	0
,, ,,	,, ,,	1853	10	0	0

Name.	Residence.	Date.	Amount.		
			£.	s.	d.
Horner, Rev. John	Mells Park, Frome . . .	1852	5	0	0
” ”	” ”	1853	5	0	0
Hoskins, Thomas	Haselbury, Crewkerne . .	1853	1	0	0
Huyshe, Rev. John	Clysthydon, Collumpton .	1855	5	0	0
Ilchester, Earl of	London	1852	10	10	0
Johnson, W. B.	Glastonbury	1856	1	1	0
Keene, Messrs.	Bath	1853	0	10	6
Kennaway, Sir J., Bart. . . .	Escot	1852	10	0	0
” ”	” ”	1853	5	0	0
Knyfton, T. T.	Uphill	1852	5	0	0
” ”	” ”	1853	2	0	0
Ley, William	Woodlands, Kenn	1853	3	3	0
” ”	” ”	1854	3	3	0
Lopes, Sir R., Bart., M.P. . .	Maristow	1853	10	0	0
Marychurch and Co.	Haverfordwest	1855	2	0	0
Miles, W., M.P.	Leigh Court	1853	5	0	0
Naish, W. B.	Stone Easton	1852	5	0	0
Newman, Thomas	Mamhead	1853	10	0	0
Newton, J. G.	Bridestowe, Okehampton .	1854	2	0	0
” ”	” ”	1855	5	0	0
Northcote, Sir S.H., Bart., M.P.	Pynes	1853	10	0	0
Pearse, Rev. S. W.	Ivybridge	1853	1	0	0
Phillips, Dr.	Torquay	1853	1	0	0
Portman, the Lord	Orchard Portman	1852	10	0	0
” ”	”	1853	10	0	0
Radcliffe, Rev. W.	Warleigh, Plymouth . .	1853	5	0	0
Randell, Thomas	Market Rasen	1856	1	1	0
Riccard, J. E. J.	South Molton	1853	1	1	0
Sanders, Thomas (deceased) .	Park Street, Bristol . . .	1853	1	1	0
Smith, A. K.	Kettering, Exeter	1852	4	4	0
Smith and Ashby	Stamford	1852	1	0	0
Sidmouth, Lord Viscount . .	Up Ottery, Devon . . .	1853	5	0	0
Sparks, W.	Crewkerne	1852	10	0	0
Synge, F. H. (deceased) . . .	Weston-super-Mare . . .	1852	1	0	0
Taylor, Robert	Ashclyst, Broadclyst . .	1853	0	10	0
Troyte, A. H. D.	Huntsham Court, Tiverton	1852	3	0	0
Uttermare, T. B.	Langport	1853	1	0	0
Welland, Rev. L. P.	Tallaton, Ottery	1856	0	10	0
Wightman and Dening . . .	Chard	1852	2	0	0
Willcox, Edmund	Godney, near Wells . . .	1854	0	10	0
Williams, James	Bath	1854	4	0	0

DONATIONS FOR SPECIFIC PURPOSES.

Name.	Residence.	Date.	Amount. £.	s.	d.
Hood, Sir Alexander, Bart.	St. Audries; addition to the Society's Prize for Two-year-old Colt for Agricultural purposes	1857	10	0	0
Parker, H.	Burnett; towards Prizes for Hampshire Downs	1854	0	10	0
Taylor, Chas. . . .	Stanton Prior, ditto	1854	0	10	0
Woolly, B. C. . . .	Wilmington, ditto	1854	1	0	0
Woolly, W.	Englishbatch, ditto	1854	0	10	0

SPECIAL DONATIONS.

	Date.	Amount. £.	s.	d.
Poultry Show at Plymouth, by Jonathan Gray, Esq.	1853	282	16	0
Poultry Show at Bath, by Jonathan Gray, Esq. . .	1854	458	0	4

Subscriptions

FROM CITIES AND TOWNS SELECTED FOR THE SOCIETY'S MEETINGS.

Town.	Date.	Amount. £.	s.	d.
Taunton, town of	1852	210	0	0
Plymouth, Devonport, and Stonehouse, towns of . .	1853	450	0	0
Bath, city of	1854	450	0	0
Tiverton, town of	1855	450	0	0
Yeovil, town of	1856	450	0	0
Newton Abbott, town of	1857	700	0	0
Cardiff, town of	1858	800	0	0

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